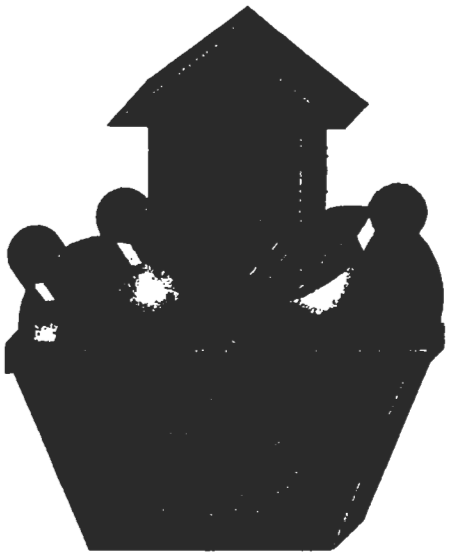
Selected Reading Material

- Mary Ann Curran: "Broad-Based Environmental Life Cycle Assessment." *Environmental Science and Technology* 27, no. 3 (1993): 430–436.
- Dale Jamieson and Klasina VanderWerf: *Cultural Barriers to Behavioral Change: General Recommendations and Resources for State Pollution Prevention Programs.* Boulder: Center for Values and Social Policy, July 1993.
- John Wise: "Challenges for the Future." In *1993 Spring Conference: Connections for Pollution Prevention,* pp. 54–62; proceedings of the National Roundtable of State Pollution Prevention Programs, San Diego, CA, 28 April 1993.

BROAD-BASED ENVIRONMENTAL LIFE CYCLE ASSESSMENT

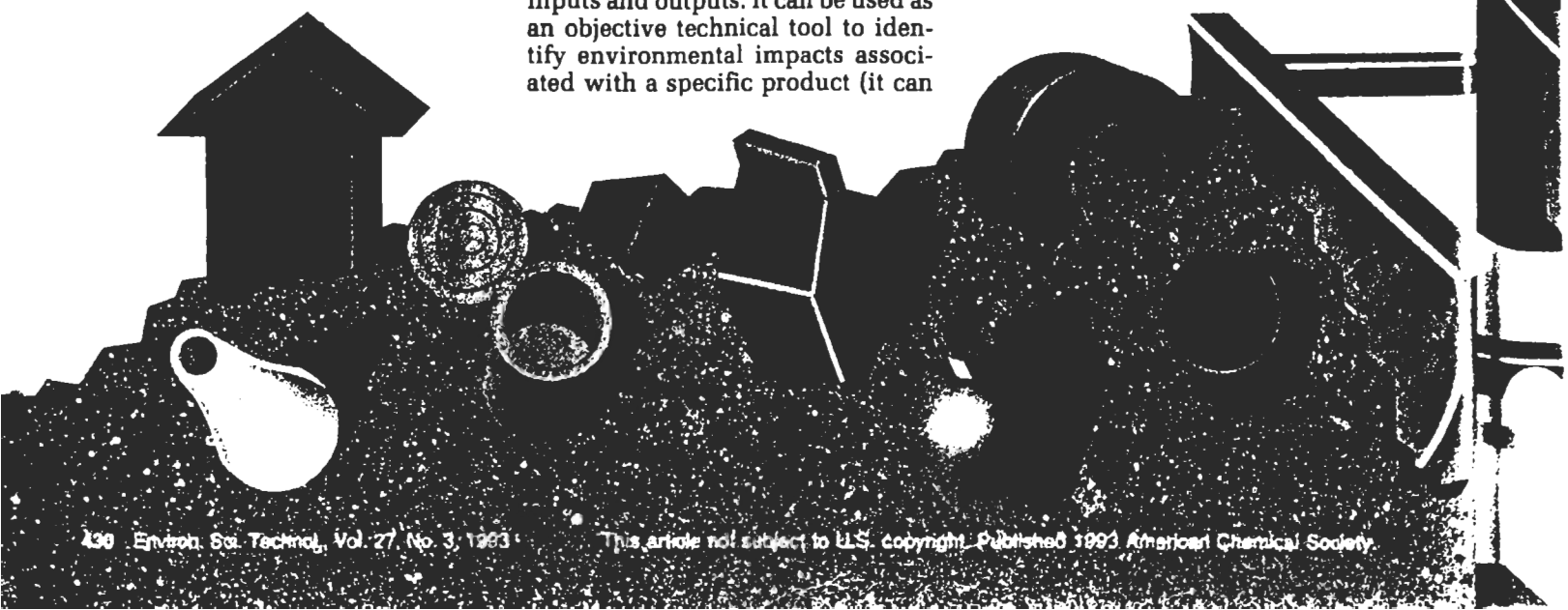


MARY ANN CURRAN
U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
Cincinnati, OH 45268

Pollution prevention through Life Cycle Assessment (LCA) is a departure from evaluating waste management options that look mainly at single issues such as recyclability or reduced toxicity.

An LCA is a snapshot in time of inputs and outputs. It can be used as an objective technical tool to identify environmental impacts associated with a specific product (it can also be applied to processes and activities, but this article focuses on products) and evaluate opportunities to reduce these impacts. The LCA is a holistic approach that analyzes the entire system around a particular product. It encompasses extracting and processing raw materials; manufacturing; transportation and distribution; use, reuse, and maintenance; and recycling and waste management (*1*). It also factors in the downstream and upstream effects of product use (*2*).

The Society of Environmental Toxicology and Chemistry defines LCA as looking holistically at the environ-



mental consequences associated with the cradle-to-grave life cycle of a process or product (*1*). The 3M Company defines its life cycle approach as looking at how waste can be reduced or eliminated starting with the point of generation in the manufacturing operation, to its processing, treatment or ultimate disposal as a residual hazardous waste (*3*).

Pollution prevention can take place at any stage in a product life cycle, and changes at any stage can have positive or negative effects on waste generation at other stages. Government programs have typically focused on releases to a single medium (air, water, or land). Although designed to reduce releases to one environmental medium, these programs can increase releases to other media. For example, when air pollution control equipment is installed in hazardous waste incinerators, large quantities of hazardous wastewater may be generated from scrubbers (*4*).

LCAs can assist in evaluating proposed changes to product or process designs so that trade-offs can be identified. For example, an apparent improvement to a product that decreases air pollutants but results in increased water-borne pollutants could be identified by an LCA. Any potentially offsetting effects of the water-borne pollutants could be accounted for in an overall environmental assessment of the product.

Product stages and LCAs

For the "raw material acquisition" stage, an LCA considers activities that involve removing materials from the Earth, such as crude oil. The second stage is "material manufacture," which includes processing raw materials, for example, turning crude oil into polymeric resin. In the "product fabrication" stage, the processed raw materials are made into products. For example, polymeric resin is melted and formed into a number of products, such as plastic bottles.

Many activities take place during the next stage: "filling, packaging, and distribution." The plastic bottle in our example is filled, packaged for transportation, and distributed for sale. Transportation, however, occurs throughout all the life cycle stages and is not accounted for as a single activity during distribution. The next stage, "use, reuse, and maintenance," incorporates how the product is used after the point of sale. The last stage, "recycling and waste management," assesses how the product is ultimately disposed of, including recycling. Figure 1 depicts the stages of a product life cycle assessment.

Procter & Gamble defines the LCA as an attitude that displays an acceptance by manufacturers of consumer products of their share of responsibility for the environmental burden caused by their products from design to disposal. It uses the LCA as a quantitative tool that ensures that real—rather than superficial—environmental improvements are identified (*5*).

EPA's definition of LCA involves examining the environmental releases and impacts of a specific product by tracking its development from a raw material, through its production, and to eventual disposal (*6*). Other names for LCA include product life cycle analysis, ecobalance, cradle-to-grave analysis, and resource and environmental profile analysis.

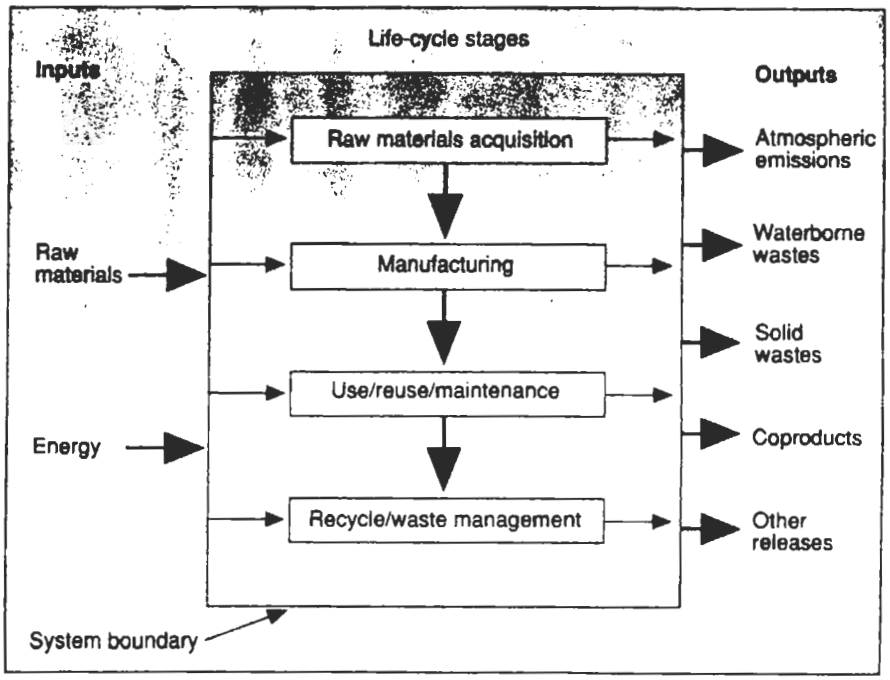
One of the major findings of a 1990 LCA workshop held by the Society of Environmental Toxicology and Chemistry (SETAC) was that complete LCAs should be composed of three separate but interrelated components: life-cycle inventory, life-cycle impact analysis, and life-cycle improvement analysis. Existing LCA efforts have focused primarily on the inventory component. Considerable research is needed to develop the impact and improvement analysis components. The workshop identified the additional research needed for the inventory component in database development and methodology refinement (*1*).

Although LCAs have been used—by industries, governmental agencies, and other organizations—in one form or another over the past several decades in Europe, the United States, and a few other countries, interest in this environmental analysis tool has grown in the past several years (*1*). Modern life-cycle inventory analysis had its beginnings in the 1960s. Concerns over the decreases of raw materials and energy resources sparked interest in finding ways to account for all energy use and project future resource supplies.

In 1969, researchers at Midwest Research Institute (Kansas City, MO) initiated a study for the Coca-Cola Company that laid the foundation for the current methods of life-cycle inventory analysis in the United States. The process of quantifying resource use and environmental releases of products became known as the Resource and Environmental Profile Analysis (REPA). With the formation of public interest groups who encouraged industry to ensure that the public receive accurate information concerning a product's environmental effects, and with the oil shortages in the early 1970s, approximately 15 REPAs were performed between 1970 and 1975.

From 1975 through the early 1980s, interest in these comprehensive studies waned because of an

FIGURE 1
Defining system boundaries



apparent end to the oil crisis, and environmental concern shifted to issues of hazardous waste management. However, throughout this time, life-cycle inventory analyses continued to be conducted (about two studies per year, most of which focused on energy requirements), and methodology improved. When solid waste became a worldwide issue in 1988, the life-cycle inventory analysis technique again became a tool for analyzing environmental problems. With the rebirth of LCAs from 1988 through 1991, the total conducted in the United States rose to more than 100.

LCA applications

LCAs can require significant labor hours to collect and verify data. Consequently, they can be very costly to do, which limits the number of products that can be studied. Because of high cost, only 100 (a small fraction) of the consumer and industrial products now available on the market have been evaluated using an LCA. However, most of the 100 that have been performed were privately funded and are not generally available to the public (*2*). Of the publicly available ones, the majority concern packaging systems, including beverage containers. Table 1 summarizes 16 U.S. life-cycle inventory studies that have been cited in the literature or released as publicly available reports.

Most LCA studies are performed to compare different products, for example, a plastic bottle with a glass bottle. In these product comparisons, the user is interested in determining which product within a certain category causes the least amount of environmental burden. Product comparisons are used mostly for marketing purposes and for helping consumers to make purchasing decisions. When assessing the environmental burdens of two products, the results typically show an "apples-to-oranges" comparison.

For example, one product may be a significant water polluter and the other may take up valuable landfill space when it is disposed. So, which is "better"? Local or regional concerns play a significant part in making the choice, and many times it is left up to the consumer to decide which product to select. Although product comparisons have been used recently for marketing purposes, because of the uncertainty and subjectivity involved in evaluating the results of an LCA, EPA and environmental groups have stated that LCAs are not ready for use as a marketing tool.

If the results of an LCA were to be used publicly, then peer review of the results is essential. Although not a formalized process, the peer review should be similar to that used for journal articles where comments from a panel of experts in the field are solicited before the paper is published.

The peer review process should start as soon as the goals for conducting the study are determined. The intent of the peer review is to ensure that the LCA study is complete, the process is open to scrutiny, quality data are used, and the conclusions fit within the scope of the data. It is very important that all assumptions made during a study be clearly stated when the results are presented (*22*).

LCAs can also serve as decision-making tools for industry. A product manufacturer compares the current product to modifications to the same product. The assessment makes it possible to determine if changes are an improvement or only a shift of environmental burden from one area to another. This "greening" of products has been used over the years by many companies, including Procter & Gamble (see surfactant study listed in Table 1).

LCA methodology

Many experts agree that LCAs are useful for identifying opportunities for pollution prevention, but without an agreed-upon approach the results are not always consistent. In a 1990 study sponsored by Procter & Gamble, A.D. Little (*21*) found that cloth diapers consume more than three times as much energy, from cradle to grave, as disposables do. But a study sponsored by the National Association of Diaper Services reported that disposables consume 70% more energy that cloth diapers do (*17*). The discrepancy can be traced largely to accounting methods. For example, the study favoring disposables counted co-generation as an energy credit, which reduced the bottom line energy usage. The other study did not count co-generation because it produces air pollution (*23*).

Data collection is another tenuous area when performing LCAs. Data may be unobtainable because of their confidential nature (proprietary data) or because of a lack of methodology or resources for obtaining data. Methodologies differ widely in their treatment of missing data. Fava et al. (*1*) stress that default values must not be calculated as zero, and the detection limits for nondetectable data should be used as the default values.

In a review of some 30 life-cycle studies, Bérubé et al. (*24*) found many other weaknesses in the use of life-cycle data. They found that the sources of information are rarely presented, except very briefly. Furthermore, it is difficult, if not impossible, to obtain detailed basic data for the entire life cycle of each system studied. In such cases, generic data—from national data bases and industrial averages—or professional judgments, whether validated or not with the industry concerned, may help to complete the information. However, in several studies, it is impossible to determine which data come from detailed sources and which are derived from general sources or based on professional judgments. Moreover, it is impossible to determine whether the uncertainty of the data significantly affects the final results of the study (*24*).

Life cycle impact analysis

LCAs can be, and should be, used when assessing the environmental profile of products. However, in a complete assessment, the results can be very complex and seldom do they lead to clear cut answers. Information from inventory analysis alone may be used to identify opportunities to decrease environmental releases and energy and raw materials use. This use of inventory data requires a "less is best" approach to identify where the data can be minimized, that is, where can the amount of pollutants or the amount of energy that is used be reduced.

The next step is to translate the quantities of releases, and energy and raw materials use into either positive or negative environmental impacts. This can include effects on resource depletion, human health, ecological health, or general human welfare. Impact analysis adds another level: Not only are quantities evaluated, but so are their relative environmental consequences.

Equal amounts of Pollutant A and Pollutant B being released may imply equal importance until an impact analysis shows that Pollutant A has much higher health risks associated with it than Pollutant B. Recognizing relative hazard helps manufacturers prioritize areas for action in order to get the best results for their investments.

However, translating the numbers from a life-cycle inventory into human health or ecological impacts is not well understood. The lack of a single method for comparing environmental impacts compounds the problem. For example, how does one pound of heavy metal sludge compare to one gallon of water usage or the consumption of one Btu of energy? In order to make a decision some type of value judgment must be made, but we are not far enough along in understanding life-cycle impacts to know how value judgments should be imposed.

To date, life-cycle studies have only marginally included environmental impacts, such as identifying renewable versus nonrenewable energy sources. Tellus Institute, however, carried the process further in a recent study of a host of packaging materials (*19*). First, they assessed existing methods to evaluate hazards posed by various pollutants. Then they created a framework to develop a method that enabled them to incorporate into their analysis the differing hazards associated with the production and disposal of packaging materials. This controversial life-cycle analysis uses a unique weighted-averaging method that takes into account environmental disposal and production costs as well as traditional disposal costs to determine a package's environmental impact. The Tellus Institute study, however, has come under much criticism, mainly as a result of the use of 20-year-old data and assumptions that some feel are improper (*25*).

It is not necessary for all LCAs to include impact analysis. Its inclusion depends on the objectives of the study and the intended use of the information. If impact analysis is desired, it is necessary to clearly define what is considered an impact in the context of an LCA. Previous impact definitions have been mixed and range from human health risks to the effects of habitat alteration. No consensus is yet available for evaluating life-cycle impacts (*26*).

The Environmental Action Foundation sums up the dilemma by pointing out that life-cycle analysis is still in its infancy. Specifically, methods developed to date do not provide the necessary data on which to base decisions about product choices. They go on to say that although there are certain problems with life cycle analysis, there are also efforts under way to improve the process (*27*).

EPA's activities

EPA is interested in encouraging manufacturers to use LCAs when developing new products or improving existing ones. No regulations exist that require assessments to be performed, nor are there any plans to make the LCA process a

TABLE 1
Life cycle assessments in the United States

Client	Practitioner	Product	Year	Reference
Coca-Cola	MRI	Beverage containers	1969	7
EPA	MRI	Beverage containers	1974	8
[illegible]	MRI	Plastics	1974	9
[illegible]	MRI	Beer containers	1974	10
Goodyear	Franklin	Soft drink containers	1978	11
Procter & Gamble	Franklin	Laundry detergent packaging	1988	5
Procter & Gamble	Franklin	Surfactants	1989	5
Unknown	Franklin	Softdrink delivery systems	1989	12
Council for Solid Waste Solutions	Franklin	Foamed polystyrene and bleached paperboard	1990	13
American Paper Institute	Franklin	Cloth and disposable diapers	1990	14
Council for Solid Waste Solutions	Franklin	Grocery sacks	1990	15
Vinyl Institute	Chem Systems	Vinyl packaging	1991	16
National Association of Diaper Services	Lehrberger & Jones	Diapers	1991	17
Council of State Governments	Tellus	Packaging	1991	18, 19
Procter & Gamble	Franklin	Hard surface cleaners	1992	20
Procter & Gamble	A.D. Little	Cloth & disposable diapers	1990	21

regulation. Instead, EPA wants to develop the process into a usable tool and demonstrate its importance in environmental protection.

Several offices within EPA have been studying life-cycle methodology since 1990 in an effort to develop a uniform approach to conducting the assessments. This type of nonregulatory "standard" will provide guidance to life cycle users as well as reduce the tendency for studies to reach apparently contradictory conclusions. EPA's Office of Research and Development, through its Risk Reduction Engineering Laboratory in Cincinnati, developed a guidance manual in late 1992 for conducting and evaluating life-cycle inventories (*22*).

This work was done in coordination with the Office of Air Quality Planning and Standards, the Office of Solid Waste, and the Office of Pollution Prevention and Toxics. The inventory manual is intended to be a practical guide for conducting and interpreting inventory analysis, and it provides a template for generalizing the inventory development process by describing a set of rules that assist in making necessary assumptions regarding assessment boundaries, data quality and coverage, and equivalency of use in a consistent fashion. It was written to be practical and useful to a broad audience.

The approach outlined in the manual is descriptive rather than prescriptive, that is, it is not a "cookbook." A more stepwise approach would require application within a specific industry because the variations among different industries prohibit making the generalized statements that are needed in a precise, step-by-step method (*22*).

Our next step will be to apply the inventory manual to several case studies within selected product categories. At the same time, we are continuing to assess the viability of performing the impact assessment component of the LCA process and plan to come out with guidelines in the next year. Also, EPA is identifying sources of data that can be used for LCA applications. It is anticipated that this effort will benefit life-cycle practitioners by providing them with information on the availability of reliable and accurate sources of data.

Future direction

As EPA continues in this area, we are pursuing cooperative efforts with other agencies, industry, and appropriate trade associations to perform LCAs and start gathering the necessary data in order to demonstrate the feasibility of LCA studies. It is anticipated that as data become more accessible to potential users, the cost of doing an LCA will decrease because much of the cost is in the labor involved in collecting data. Consequently, more users will be able to apply the LCA tool to more products. We will also continue to study the impact analysis component of this assessment in order to develop guidance in this area as well.

However, members of the SETAC LCA Advisory Group—an international panel of scientists representing government, academia, industry, and environmentalists—say that the assessment methods need to be further researched before drawing conclusions about specific products. Also, assessments could be misused by those seeking a market advantage.

The Advisory Group strongly supports the internal use of LCA inventories by companies examining their own processes in an attempt to make improvements in product design. However, the LCA model is not developed to the point where external judgment can be made about the relative environmental impact of some processes and products (*6*).

With continued research into refining LCA methodology and making life-cycle data more accessible, the assessments have the potential to become a powerful tool to reduce the environmental burdens associated with a product, process, or activity. Both manufacturers and consumers are realizing the need to look at the cradle-to-grave environmental consequences of the products they make and use. An LCA will not provide all the answers, but used along with other sources of information, such as cost accounting, it contributes much needed information in a comprehensive decision process.

Although the research described in this article has been funded by the U.S. Environmental Protection Agency, it has

not been subjected to the Agency's peer and administrative review and therefore may not necesssarily reflect the views of the Agency, and no official endorsement should be inferred.

***Mary Ann Curran** is a chemical engineer in EPA's Risk Reduction Engineering Laboratory. She has more than 12 years' experience in conducting various engineering and research projects involving environmental issues. She is currently manager of EPA's LCA research program. She received a B.S. degree in chemical engineering from the University of Cincinnati in 1980.*

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Pollution Prevention and Environmental Studies
NATIONAL POLLUTION PREVENTION CENTER FOR HIGHER EDUCATION

Cultural Barriers to Behavioral Change:

General Recommendations and Resources for State Pollution Prevention Programs

A Report to the U.S. Environmental Protection Agency Under Grant #XB19192-01-0.

By Dale Jamieson and Klasina VanderWerf,
Center for Values and Social Policy,
University of Colorado, Boulder

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July 1993

by

Dale Jamieson and Klasina VanderWerf
Center for Values and Social Policy
University of Colorado, Boulder 80309-0232
Telephone 303-492-6964 Fax 8386

Robert Simmons
US EPA Project Officer
Denver, Colorado

PREFACE

This report has grown out of many years of thought and discussion about how cultural values affect environmental behavior. We have learned a great deal from many people who cannot all be acknowledged here. However, we would especially like to thank , who helped to conceive this project and has been instrumental in carrying it out;) and . (University of) who ably served as project advisors; (University of) and (University of) for their extensive comments on earlier drafts of this report; and and for their work in producing the final document. Finally, we would like to gratefully acknowledge the support of the late , whose work on attitude and behavior change inspired a generation of researchers and substantially contributed to making America a more tolerant and environmentally responsible society.

The first draft of this report was presented at a national/international workshop held in . This discussion among a diverse group of government officials and academics was one of the most stimulating in which we have ever participated. We learned a great deal from the workshop, some of which we are still assimilating. During the Spring of 1993 we had the opportunity of presenting our findings at a meeting of the and at a state pollution prevention conference organized by . This report is immeasurably better because of these experiences.

This report builds upon and synthesizes the work of a large number of researchers, government officials, and activists whose work contributes to preventing pollution. Perhaps the greatest single benefit that we hope this work produces is to make this community more self-conscious, and to stimulate further work in exploring and resolving cultural barriers to pollution prevention.

July, 1993

EXECUTIVE SUMMARY

In this report we discuss cultural barriers and incentives to pollution prevention behavior and make recommendations to state and other pollution prevention programs on how to address cultural barriers and incentives. Cultural barriers such as beliefs, desires, emotions, attitudes, values, mental models, and patterns of reasoning can be as powerful in inhibiting pollution prevention behavior as physical, institutional, technological, or legislative barriers. Likewise, changing beliefs, values, attitudes, and other cultural barriers can play an important role in facilitating pollution prevention behavior.

Although there are many pollution prevention programs at the state and local levels, many of these programs are not as effective as might be hoped. Programs that simply provide information to producers and consumers are often ineffective and sometimes even counterproductive. In some cases such programs may reinforce values, attitudes, and behaviors that must be changed if we are to prevent pollution.

The purpose of this report is to survey what is known about cultural barriers and incentives to pollution prevention, to make some tentative recommendations, and to set an agenda for future research. We review literature from several different disciplines including psychology, sociology, economics, and philosophy. While enough is known to identify some barriers and facilitators as well as to make general recommendations, important gaps in our knowledge remain. Furthermore, substantial difficulties are involved in bringing different areas of academic and other professional expertise into conversation with one another.

Pollution prevention has risen in importance as it has become increasingly clear that human activity is bringing about many local and global environmental changes that are detrimental to humans and other living things. Thus far, however, most of our efforts have been directed toward trying to ameliorate or reverse what has

already been done. These clean-up efforts are helpful, but they are not sufficient to address the extent and magnitude of our current problems, particularly because they do not address the long-term challenges posed by environmental change. What is needed is a vision of a sustainable future, and some sense of how to get there from here. Individuals, businesses, and government will all have to share the burden of this transition. Indeed, if pollution prevention is to succeed over the long term, it must increasingly be seen not as a burden, but as a way of life voluntarily chosen and willingly embraced.

Pollution is, in part, a behavioral problem, and behavior can be extremely difficult to change. Yet a change in behavior will be necessary if long-term environmental goals are to be met, and it will surely also be accompanied by cultural changes that involve significant shifts in values. A fundamental shift in focus needs to occur. Rather than seeing the environment as something external to us that it is the responsibility of environmental professionals to maintain, we must focus on seeing ourselves as situated in an environment which it is our responsibility to preserve. Prevention approaches focus on a sense of obligation and responsibility.

The prevention approach to pollution problems is gaining attention because we have come to recognize that our current efforts don't provide a complete solution to the problem. Although the current strategy of "command and control" has proven valuable in dealing with pollutants once they are created and in the system, it does not address preventing the creation of pollutants in the first place. Pollution prevention provides us with the other critical tool necessary for dealing with the problem of pollution. It can also prove valuable by creating a solution which has the commitment and investment of all those involved and which instills the kind of individual behavior and sense of responsibility on which long-term environmental protection is built.

The incorporation of a pollution prevention approach will not be without difficulty. Many barriers and difficulties stand in the way of implementation--the pollution prevention approach places

great demands on all actors including government, business, and consumers for greater knowledge about the effects of their actions, common tools of measurement and evaluation, and coordination of efforts toward a common goal. Yet despite these difficulties, the potential of adding pollution prevention to the tools that we already have is so great that it is important to pursue it.

State pollution prevention programs could make a difference over the long term in a number of different areas, including production and consumption of toxics, consumer products, energy use, climate stabilization, and pollution prevention education. But first it is important to have a clear understanding of what pollution prevention is. We can generally distinguish two types of pollution prevention behavior. One kind is directed toward reaching some existing goal by employing alternative means that produce less pollution. Another kind involves actually shifting our goals.

Since pollution prevention bears on many different yet often overlapping issues, a successful program must be "multi-media"--it cannot rely on a single method or approach. Additionally, in order to be maximally effective, pollution prevention programs must touch the lives of all citizens. Thus, various cultural barriers and facilitators must be addressed if pollution prevention behavior is to become the norm. Bringing about long-term, sustainable change toward pollution prevention involves understanding the cultural beliefs, desires, emotional responses, attitudes, values, patterns of reasoning, and mental models that sustain present behavior. Despite the importance of cultural barriers to pollution prevention, of all the barriers they are the least understood, because they are complex, and they are often neglected or overlooked. Overcoming these barriers is key to successfully implementing a prevention program.

One of these cultural barriers concerns people's values. A successful pollution prevention program depends on people coming to value efficiency and even sufficiency over excessive consumption. Yet any program whose success depends on a reorientation of basic

values must be sensitive to charges of manipulation and exploitation. Thus, it is important in the implementation of pollution prevention programs to respect people as active information processors and knowledge-users. Indeed, if long-term success rather than merely the short-term modification of behavior is to be achieved, it is vital that people's values, beliefs, and reasoning become more reflective, and this requires treating them with respect. Thoughtful, reflective citizens are more likely to produce long-term sustainable change than those whose motivations and concerns are short-term. It is also important to recognize that pollution prevention does not require a radical revision of everyday values. Surveys show that environmental values are strongly held by many Americans. For many people the strongest motivator for pollution prevention will be concerns for children and community, values already deeply rooted in American life.

The literature we have surveyed regarding cultural barriers to pollution prevention comes from a wide variety of disciplines. Consequently there is some fragmentation of information, and often wide diversity in methods, use of concepts, and structure of models. Because of these gaps in the available literature, we have found that the best way to use it for policy purposes is to read it suggestively. Much of the literature is quite rich when approached in this way.

Our literature review covers studies that have employed four basic methods: surveys, behavioral experiments, ethnographic interviews, and the synthetic-analytic approach. These different methods employ various usages of key concepts and words. In an effort to simplify the use of concepts across the various disciplines and methods, we identify seven factors that affect behavior: beliefs, desires, attitudes, values, emotions, patterns of reasoning, and mental models. Depending on how these factors are functioning, they can either facilitate behavioral change or act as a barrier to it. While these concepts apply most naturally to individuals, they also apply to institutions and collectives.

Beliefs, desires, and emotions are most immediately connected

with individual behavior. Values and attitudes underlie and help to generate or rationalize particular beliefs, desires, and emotions. Mental models provide the framework in which these features are embedded. Patterns of reasoning affect the perceived relationships between these elements and can also produce new beliefs or values. All of us hold beliefs that are true and also beliefs that are false. We have a multiplicity of desires, a plurality of attitudes, and a host of diverse values. Any attempt to overcome cultural barriers to pollution prevention behavior must confront the reality of our existing mental models. A number of different conceptual models for behavioral change have been employed in the literature we surveyed, but two models have been especially influential: the rational choice model and the attitude model. The basic idea behind the rational choice model is that people's behavior is determined by their interests. The attitude model supposes that people's actions are caused by underlying positive or negative dispositions toward the results of these actions. We briefly review three specific types of attitude models: a causal model of environmentally relevant behavior, a psychological-social model of energy conservation, and a decision-making model of environmental behavior.

Although the existing literature related to cultural barriers to pollution prevention behavior is strikingly uneven with respect to the problems it addresses, it is possible to summarize some basic themes: behavioral studies have focused primarily on individuals and households rather than institutions and workplaces; emphasis has been placed on relatively small day-to-day choices rather than major investment decisions; and relatively little attention has been paid to how one environment-friendly behavior may lead to others.

In our literature review, we begin by looking at some themes that have emerged about how various individual attributes may affect pollution prevention behavior. The attributes we consider are demographic factors, positional factors (reflecting one's situation, e.g., homeowner or renter), attitudes and past behavior,

mental models, attitudes toward risk, and values. Next we consider the effects of the social milieu of the individual, since social norms and community expectations are clearly important in sustaining a pattern of behavior. Even if a person is not closely linked to a community, the prevailing norms and expectations may still bring the person's behavior into conformity with community values. We then look at facilitators and barriers that may affect the performance of environment-friendly actions, including a sense of efficacy, public commitment, rewards, coercion, shame and embarrassment, and personal experience. Finally, we consider four factors involved in the effectiveness of information provision: salience, utility, persuasiveness, and feedback mechanisms.

Our report contains sixteen tentative recommendations that we have developed based on what we have learned from analyzing the literature and from interviews with a variety of people active in pollution prevention. They are general recommendations, based on our research and our best guesses, and therefore intended to be used as guidelines for those who work in pollution prevention. Although they cannot be applied mechanically, they should be useful when applied with the insight and sensitivity of those who work in particular programs and who know what their own specific needs are. Our recommendations are as follows:

1) Rewards and incentives may not be as effective as values in sustaining behavior over the long-term.
2) Values that we already hold can be powerful.
3) Specific values may be more important in generating action than general values.
4) Knowing how to prevent pollution may be as important as wanting to prevent pollution.
5) How information is presented helps to determine its effectiveness.
6) The credibility of information is affected by its source.
7) New information is understood in terms of old concepts.
8) Stories, anecdotes, and analogies can be powerful resources.

9) It is generally more effective to work through existing communities or groups than to build new ones.

10) Information about the effects of our past actions influences present behavior.

11) People are more likely to act if their behavior clearly makes a difference.

12) People are more likely to act if they feel responsible for an outcome.

13) Public commitment makes people more likely to act.

14) Role models are important.

15) Change agents are important.

16) The quality of relationships matters.

Our report concludes with an outline of an agenda for future research and other work into cultural barriers and facilitators to pollution prevention behavior. Gaps in the existing literature on cultural barriers suggest that it will be important to provide definition and organization to this new field of study that incorporates such diverse disciplines. Several particular areas of research within the arena of cultural barriers also deserve more attention. For instance, although we gained insight into how values are formed in general, we lack methods for predicting value change. Future research on this topic will be necessary, as will consideration of the ethics of modifying the values of others. The role of psychological research should be emphasized as well, because pollution prevention is ultimately a matter of human behavior. It is humans who make consumer choices and energy use decisions and who can bring pressure to bear on those who pollute. To that end, we also need more specific information about how people make consumer decisions, particularly those related to capital purchases such as furnaces, cars, or refrigerators. Finally, practical considerations suggest that research on institutions as well as individuals will be necessary, and on-going analysis of existing pollution prevention activities will undoubtedly contribute to the success of any pollution prevention program.

PART I: THE PROBLEM

In this report we discuss cultural barriers and incentives to pollution prevention behavior and make recommendations to state and other pollution prevention programs on how to address cultural barriers and incentives. Cultural barriers such as beliefs, desires, emotions, attitudes, values, mental models, and patterns of reasoning can be as powerful in inhibiting pollution prevention behavior as physical or technological barriers. Likewise, changing beliefs, values, attitudes, and other cultural barriers can play an important role in facilitating pollution prevention behavior.

State governments are well positioned to help bring about the transition to a society that prevents pollution, away from one that devotes an ever-increasing share of its resources to trying to mitigate the effects of pollution. Through public information programs, outreach, technical assistance, and proactive planning, state governments can be effective agents in making pollution prevention a reality.

Although there are many pollution prevention programs at the state and local levels, many of these programs are not as effective as might be hoped. Programs that simply provide information to producers and consumers are often ineffective and sometimes even counterproductive. In some cases such programs may reinforce values, attitudes, and behaviors that must be changed if we are to prevent pollution.

The purpose of this report is to survey what is known about cultural barriers and incentives to pollution prevention, to make some tentative recommendations, and to set an agenda for future research. We review literature from several different academic disciplines including psychology, sociology, economics, and philosophy. While enough is known to identify some barriers and facilitators and to make some recommendations, important gaps in our knowledge remain. Furthermore, substantial difficulties are involved in bringing different areas of academic expertise into

conversation with one another.

Pollution prevention has risen in importance as it has become increasingly clear that human activity is bringing about many local and global environmental changes that are detrimental to humans and other living things. For example, the diminishing of the ozone layer weakens the shield that protects living things from ultraviolet radiation; the pollution of air and water poses health risks; and the production and consumption of toxic materials makes sections of our cities and states unsightly and unsafe.

Thus far most of our efforts have been directed toward trying to ameliorate or reverse what has been done. Efforts to clean up pollution can help to alleviate the situation, but they are not sufficient to address the extent and magnitude of our current problems. "End-of-pipe" regulation imposes large costs on the economy, and it cannot answer the widespread popular concern about even very small concentrations of pollutants.

Most important, amelioration efforts do not address the long-term challenges posed by environmental change. What is needed is a vision of a sustainable future, and some sense of how to get there from here. State and federal agencies alone cannot ensure this transition. For such a vision to be successfully implemented it will have to engage with people's basic values and appeal to their sense of responsibility. Individuals, businesses, and government will all have to share the burden of pollution prevention. Indeed, if pollution prevention is to succeed over the long term, it must increasingly be seen not as a burden, but as a way of life voluntarily chosen and willingly embraced.

Government regulation has an important role to play, and it is difficult to imagine a future in which it does not play a part. But the excessive use of regulation creates an atmosphere that is not conducive to long-term success. For in order to secure a sustainable future we must engage people's voluntary impulses and desires for change, and a social climate characterized by government coercion is inhospitable to these impulses and desires. As a nation we must make reflective choices about the level of

environmental quality that we desire and align our behavior with our considered judgments.

Clearly there will never be complete agreement across all sectors and communities about the appropriate level of environmental quality. But we must move beyond the present situation in which conflicts arise not just between people, but also within people. Many of us desire higher levels of environmental quality, yet our behavior contributes to environmental degradation. Part of the reason for this is the work situations we find ourselves in, our lack of alternatives with respect to our consumer choices, and so on. Yet both as individuals and as a society we must do more to reconcile our values and our behavior, and our beliefs and our actions.

Pollution prevention strategies and policies can make an important contribution in securing long-term environmental success. State programs in particular, because they can reflect regional choices and values and serve as laboratories for experimentation, have the potential to be on the cutting edge of pollution prevention. However, it will not be easy for state pollution prevention programs to define their roles and to carry them out successfully. Pollution is, in part, a behavioral problem, and behavior can be extremely difficult to change. Yet if long-term environmental goals are to be met, changes in behavior must occur. If new environment-friendly patterns of behavior are to be stable and enduring, they must be accompanied by cultural changes that involve significant shifts in values.

A. A PREVENTION APPROACH

Prevention is a major goal in various areas of human life. As a society we have come to see that prevention is the best solution for various health problems such as cancer and heart disease. At a personal level most of us recognize that preventive maintenance for our cars and homes is a good strategy. The focus on prevention brings with it a sense of obligation and responsibility. In order for many public health programs to be successful, people must come to feel responsible for their own health. Instead of seeing their

bodies as machines that it is the job of health professionals to maintain, they must come to see themselves as embodied, with the responsibility to do what they can to keep themselves healthy.

Like these other prevention approaches, pollution prevention requires a fundamental shift of focus. Rather than seeing the environment as something external to us that it is the responsibility of environmental professionals to maintain, the pollution prevention approach focuses on seeing ourselves as situated in an environment which it is our responsibility to preserve.

A prevention approach to pollution is gaining attention because of the widespread perception that our current efforts at environmental protection are failing. Many people argue that our current patterns of resource use are inconsistent with global equity and also deprive future generations of what should be their birthright. Moreover, while non-renewable resources appear to be in good supply, pollution generated from human activity increasingly threatens renewable resources such as air, water, soils, biodiversity, ozone, and climate.

In addition to these large-scale concerns, many people believe that our "command and control" approach to environmental protection isn't a complete solution to the problem. Pollution prevention is the other part of the solution. While command and control can be effective in dealing with pollutants that are already in the system, we need in addition to seek a solution that attempts wherever possible to eliminate the creation of the pollutants in the first place.

Command and control has been criticized because it imposes an adversarial model on environmental regulation, thereby driving out "win/win" alternatives. It has also been criticized because it can foster a minimal commitment, that is, encouraging people to do only what is absolutely necessary to meet standards and no more. And command and control has been further critized because it locates the responsibility for dealing with pollution with the government and with business rather than encouraging the individual behavior

and sense of responsibility on which long-term environmental protection is built.

Despite the difficulties involved in moving to a pollution prevention focus, such an approach has much to recommend it. Actions that prevent pollution can have a greater impact than actions that try to mitigate a problem which already exists. For example, purchasing a fuel-efficient car will contribute less to pollution than the careful maintenance of an inefficient vehicle, and cutting back on packaging can do more for waste reduction than recycling paper. Moreover, many of the problems that result from human activity, such as the release of chlorofluorocarbons, are difficult if not impossible to control once they have been set in motion. Controlling pollution at its source is often much more effective than responding once it has become diffuse.

Generally across the economy, a pollution prevention approach makes good economic sense and will contribute to competitiveness and stimulate new business opportunities. Both international and domestic experience shows that pollution prevention and economic growth can go hand-in-hand. In many cases, it is cheaper to prevent pollution than to clean it up. Over the long term many of the strategies involved in pollution prevention programs will lead to more efficient and effective use of resources, thus contributing to both economic and national security and sustainability. This does not mean, however, that all facilities, sectors, and regions will benefit equally from pollution prevention. Changes of policy and focus always create winners and losers, even if only in positional terms. Not every facility in every industry will survive in a pollution prevention environment.

Perhaps the most important reason for adopting a pollution prevention approach is that it has the potential to provide a central organizing principle for our environmental protection efforts. These efforts have often been fragmented across various divides: single-medium programs are often not coordinated with each other; regulatory agencies at different levels of government often make different, even inconsistent, demands; the culture of

enforcement often seems contradictory to the culture of problem-solving.

The pollution prevention approach provides an opportunity for dealing with these problems in a consistent way. By providing a common focus for environmental protection efforts, it can establish common ground on which to negotiate these divisions. However, it would be foolish to expect these divisions to disappear entirely. To some extent they are established by legislation and nourished by history and tradition. At the same time the pollution prevention approach presents us with our best opportunity for overcoming these divisions.

At this stage, however, pollution prevention should be thought of as a vision for the future rather than a policy of the present. If pollution prevention were easy to implement it would already be in place either through the magic of the market or through administrative directive. Many barriers and difficulties need to be overcome. The pollution prevention approach places great demands on all actors including government, business, and consumers for greater knowledge about the effects of their actions, common tools of measurement and evaluation, and coordination of efforts toward a common goal. Yet despite these difficulties, the potential of pollution prevention is so great that it is important to pursue it.

B. SOME KEY POLLUTION PREVENTION ISSUES

State pollution prevention programs could make a difference over the long term in a number of different areas, including production and consumption of toxics, consumer products, energy use, climate stabilization, and pollution prevention education. Before discussing these areas, it is important that we have a clear understanding of what pollution prevention is.

Pollution prevention means different things to different people. To some people it is a fashionable buzzword with little content; to others it is a new set of demands and responsibilities piled on top of others that are themselves barely manageable. In practice, for many people, pollution prevention means getting

businesses to reduce their use of toxic materials.

In addition to these understandings of pollution prevention, this term is also defined in the federal Pollution Prevention Act of 1990, in subsequent US EPA policy statements, and in legislation passed in more than half the states. US EPA's definition of pollution prevention includes source reduction and any other practices that reduce or eliminate the creation of pollutants through increased efficiency or conservation. Source reduction is any practice that reduces the amount of any hazardous substance, pollutant, or contaminant that is released into the environment, or reduces the hazards to public health and the environment associated with the release of such substances. A broad definition of pollution prevention includes recycling because it is an activity which avoids the creation of new pollutants. Definitions in state legislation are narrower in some cases and broader in others.

We can generally distinguish two kinds of pollution prevention behavior. One kind of pollution prevention behavior is directed toward reaching some existing goal by employing alternative means that produce less pollution. Examples of pollution prevention behavior of this type include replacing toxic solvents with nontoxic ones, reducing packaging, using energy-efficient light bulbs, bicycling instead of driving, and carrying a cup to work. Another kind of pollution prevention behavior involves shifting our goals. For example, telecommuting may not be a perfect substitute for commuting. Contact by fax or telephone is not the same as face-to-face interaction. Yet telecommuting may serve enough of the purposes of commuting to make it a feasible alternative, and it may also open up other possibilities that may help us to realize other goals (e.g., by permitting us to work at home, and so on). Similarly, avoiding the use of toxic lawn chemicals may require us to grow different plants.

The areas identified as pollution prevention target areas for the purposes of this report overlap in various ways. For example, programs that promote energy efficiency contribute to climate stabilization by reducing emissions of carbon dioxide. Reducing

packaging of household products may help to minimize consumption and production of toxic materials. Furthermore, pollution prevention education is important to making gains in all of these areas.

Before discussing some of the key concepts involved in thinking about cultural barriers to pollution prevention, we will briefly discuss these five areas of concern.

1. The Production and Consumption of Toxics

One important target of pollution prevention programs is the production and consumption of toxics. Although we need to reduce the production of toxics and also provide consumers with effective alternatives for the toxics that are now in use, this issue may be overemphasized relative to other pollution prevention issues. This may be a result of the fact that pollution prevention programs are often housed in offices whose main charge is the regulation of toxics, and they are often funded by fees and penalties assessed on producers who use toxic materials. The use of toxics is a tempting target for those who are interested in pollution prevention because there are a relatively small number of large actors in this area about whom quite a lot is known due to various reporting requirements. It is important to remember, however, that not all pollution prevention problems have this profile.

One problem that arises when considering the question of toxics concerns its definition. Scientists, regulators, and industry may all have different views about whether or not a particular product should be considered toxic. In addition to definitional differences, the toxicity of many materials is a matter of great uncertainty. Moreover, people have different attitudes toward this uncertainty. Toxicity is probably best thought of as a matter of degree; but here again, people differ about the degree of risk that they regard as acceptable. To some extent a pollution prevention perspective helps us to cut through these problems: it makes sense to reduce the use of any material, however toxic, whenever possible.

Materials that are to some extent toxic occur in a wide range

of household products. For example, metals such as cadmium, lead, and mercury are used in batteries, pigments, plastics, and paints. Toxic organic substances include solvents, petroleum distillates, and volatile organic compounds that are used in cleaners, lubricators, paints, varnishes, plastics, dyes, and pigments. Acids and alkalies are found in such common household products as bleaches and cleaners.

The production and consumption of toxics pose a range of societal problems. They present issues both with respect to worker safety and safe household use. There are also well-publicized difficulties in disposing of toxic materials. Although people use these materials, they do not readily accept living near disposal sites. Pollution prevention programs have the potential to minimize these problems by reducing the amount of toxic material that is produced and consumed.

2. Consumer Products

Consumer products is an area with a great deal of pollution prevention potential. Tracing the life cycle of a product from production to disposal demonstrates the range of problems that can result from consumer products. Extractive industries that make available the raw materials for consumer products are associated with many environmental problems. Mineral extraction is associated with problems of air and water quality and often leads to toxic residues. Logging often creates ecological problems and threatens other resources such as fisheries. Fabrication processes pose problems in many different areas. After a product has worn out, been exhausted, or fallen from favor it is dubbed "garbage," and becomes a problem for waste disposal.

In recent years problems of waste disposal have gotten a great deal of attention. It is becoming increasingly difficult for communities to find adequate waste disposal sites, even when the waste is not classified as hazardous. Alternatives to landfills such as incinerators have engendered a great deal of resistance. Yet according to reports of the Organization for Economic Cooperation and Development, the per capita waste generation of

Americans, and indeed most people in the industrialized world, continues to increase. The pressures of waste disposal are felt by people in various areas of their lives, ranging from litter in their communities to higher taxes and fees to fund the creation of new waste disposal sites.

Reuse and recycling are two approaches to these problems associated with consumer products. Many products can be efficiently recycled, requiring significantly fewer environmental inputs than the fabrication of a replacement product. For example, a recycled aluminum can be produced with about one-third of the energy investment of a new can. A reusable glass bottle can be used 40-50 times for the energy investment required to manufacture a replacement. But there are serious difficulties in the economics of recycling, and many consumer products cannot be recycled at all. Although experiments in recycling such products as automobiles are currently underway, prevention is a simpler and more effective approach if it can be put into practice.

Packaging reduction is one obvious target for pollution prevention programs. Since 1990 McDonald's has been working with the Environmental Defense Fund to reduce waste. This campaign appears to be successful in several ways: McDonald's is taking significant steps to reduce waste; by demonstrating their commitment to waste reduction, McDonald's has gained public relations benefits; finally, the efforts McDonald's has been making have contributed to educating its employees, suppliers, and customers about pollution prevention.

More generally, the use of reusable shopping bags, bulk purchasing, and packaging reduction shows that our purposes as consumers can be just as well served with fewer environmental inputs. However, in the long term it may be necessary to go beyond programs that take our present goals as fixed. Consumer products are a means to quality of life and fulfillment, not ends in themselves. We need to begin thinking about how quality of life can be improved with fewer environmental inputs.

3. Energy Use

The use of energy entails many different environmental problems. The use of fossil fuels such as wood, coal, and oil produces large amounts of atmospheric pollution that are difficult and expensive to control. Pollutants that result from the combustion of fossil fuels cause respiratory and cardiovascular problems in humans, degrade visibility, and may contribute to climate change. These pollutants are also implicated in the production of acid precipitation which has deleterious effects on ecosystems and materials. Nuclear power generation is regarded as unacceptably unsafe by many people and creates problems of waste disposal that have not yet been solved. Even "renewable" energy sources such as solar, wind, and hydroelectric generation create visual or noise pollution and sometimes have undesirable ecological effects.

Energy efficiency is central to pollution prevention since using less energy is the most effective way of reducing the pollution that results from its use. Many effective programs that encourage energy efficiency are currently in place. The EPA's "green lights" program has had an important effect on business, and some local utility companies have mounted aggressive campaigns that include subsidies for residential insulation and the use of energy efficient lighting sources. Innovative pricing structures have also helped to reduce peak demand. New cars and appliances are in most cases much more energy efficient than those they replace, and stickering programs help consumers to make informed decisions.

Yet despite these gains, much remains to be done in reducing the use of energy. While the United States is now producing more economic benefits from less energy consumption than it was two decades ago, these gains are relative and not absolute: American energy consumption continues to rise. We continue to have a more energy-intensive economy and society than almost any other country. The potential for further efficiency gains is very great. However, changes in life-style may be required to realize some of these gains.

As we shall discuss in Part II of this report, energy

efficiency is an area that has received a great deal of attention. Faced with the same economic incentives, different people sometimes respond in very different ways. We are challenged in the pollution prevention area both to produce greater gains in energy efficiency and also to see how what is known about energy use can be transferred to other areas with pollution prevention potential.

4. Climate Stabilization

In recent years concern has mounted about the possibility of anthropogenic climate change. Many scientists believe that emissions of such gases as carbon dioxide, methane, and chlorofluorocarbons caused by human activity have the potential to bring about a dramatic change of climate in a relatively short period of time. If such climate change occurs it will have serious effects on wilderness and endangered species, on the fabric of international relations, and on the American economy and way of life.

The issue of climate stabilization is complicated, but it is clear that pollution prevention activities have a role to play in reducing the risk of climate change. One of these areas has already been discussed. If we succeed in reducing our production and consumption of fossil fuels, then the threat of climate change will to some extent diminish. Further, a general pollution prevention focus that seeks to produce greater quality of life from fewer environmental inputs and outputs is likely to contribute to climate stabilization. At this stage climate stabilization perhaps is best seen as a welcome secondary effect of other pollution prevention activities. Over the long term, however, the possibility of climate change could well have a dramatic effect on how we organize our economy and society.

5. Pollution Prevention Education

Pollution prevention education is an important concept that underpins efforts in all four of the other areas. If pollution prevention is to be successful, people will need to be effectively educated about toxics, consumer products, energy, and the risk of climate change. Moreover, they will need some basic competence

with respect to the pollution prevention concepts that underlie all of these specific concerns. In this respect pollution prevention education must be holistic and comprehensive, focusing on the systemic sources of pollution and how they can be addressed.

Education can be considered in both a broad and narrow sense. In the broad sense education permeates all areas of our lives. Education occurs when we talk to friends and neighbors, watch television, and learn from experience. In this broad sense almost every pollution prevention program can be thought of as having an educational dimension.

Education in a narrower sense is what occurs in such institutions as schools and colleges. Although in recent years environmental education has become more prominent in educational institutions, the goal of pollution prevention challenges us to reform curricula and even to rethink some of the basic concepts of education. There are some recent attempts to do this in higher education, coordinated by the National Pollution Prevention Center for Higher Education at the University of Michigan.

Education both broadly and narrowly construed can be either declarative or procedural. Declarative education focuses on teaching students what is the case. It involves knowledge that is primarily propositional in form--the sort of knowing that in the philosophical literature is called "knowing that." Procedural knowledge focuses on teaching students how to do things. It is directed toward giving students the behavioral competence to undertake specific tasks. In the philosophical literature this sort of knowing is referred to as "knowing how." Both kinds of education are important for pollution prevention. Shifts in beliefs, values, attitudes and so on require propositional knowledge; but acting on this knowledge requires behavioral skills and competencies.

Pollution prevention education can take many specific forms. In one form it may consist in making available to students information that will make them aware of alternatives to everyday pollution producing activities. For example, pollution prevention

education may teach students about composting as an alternative to disposing of organic wastes in landfills. This kind of education can be useful, but its effectiveness is limited by many of the difficulties that face public education campaigns in general (see Part II.B.3).

A second form of pollution prevention education may directly address the cultural barriers that we discuss in this report. Students may specifically learn about various obstacles to the employment of pollution prevention technologies and practices. By making students aware of these obstacles, we may hope to overcome them. For example, once students learn that they tend to systematically underestimate the amount of waste they produce, they may become more conscious about household waste and do a better job of reducing it.

A third form of pollution prevention education is the most challenging. Orr (1992) notes that while the importance of literacy and numeracy are emphasized in our educational systems, the idea of "ecological literacy" has yet to take hold. We might think of ecological literacy as competence in understanding the environmental effects of our actions. An ecologically literate person would be one who associates with each commodity that he or she consumes all of its environmental effects from its production to its disposal. For example, an ecologically literate person would understand both the short-term and long-term environmental consequences of burning one gallon of gasoline when deciding what kind of car to buy.

Ecological literacy is a challenging ideal because rather than being an additional goal or area of study, it suggests a systematically different approach to education. Ecological literacy might be taught in conjunction with history, art, or mathematics. Indeed the very functioning of a school could well provide a lesson in ecological literacy. With the help of teachers, students could research both the sources and effects of the energy that powers the school; the life-cycle of the food that is served in the cafeteria could be studied along with the systems

that bring water to the school and dispose of it as waste.

Because pollution prevention is so closely associated with how we live our lives, many exciting pollution prevention programs can be undertaken in the schools, ones that employ "hands-on" techniques that may produce lasting effects on students. Indeed, many very good educational programs are already in place. These programs have an important role to play in addressing pollution prevention. Despite their potential benefits, pollution prevention programs face some unique and extremely complex problems. An understanding of these problems helps to explain why historically there has been a lack of attention to source reduction and other pollution prevention measures. Since pollution prevention bears on many different issues ranging from energy consumption to the production and consumption of toxic materials, a successful program must be "multi-media"; it cannot rely on a single method or approach. In order to be maximally effective, state pollution prevention programs as well as those at other levels of government must touch the lives of all citizens. Every producer and consumer is a pollution prevention actor.

C. CULTURAL BARRIERS AND FACILITATORS

Various cultural barriers must be addressed if pollution prevention is to become the norm. New pollution prevention technologies will do little good if people do not use them. "Getting the prices right" is part of the solution, but in some areas people have shown remarkable resistance to change even in the face of shifting economic incentives. Moreover, it is unlikely that we will systematically restructure our economy so that it rewards pollution prevention behavior unless pollution prevention comes to be something that people strongly value.

Discussions often polarize between those who believe that in order to achieve pollution prevention corporate and governmental institutions must change, and those who believe that the burden is on individuals to change their values and behavior. We believe that this is a false dilemma. In order for institutions to change, individuals will have to make new demands upon them. Individuals

are more likely to change their values and behavior in a sympathetic institutional environment.

Bringing about long-term, sustainable change toward pollution prevention involves understanding the cultural beliefs, desires, emotional responses, attitudes, values, patterns of reasoning, and mental models that sustain present behavior. It is in these areas that cultural barriers to pollution prevention in both individuals and organizations can be found. It is important to remember, however, that what is a barrier from one point of view can be, from another perspective, a facilitator. For example, if a bias toward the "near and dear" is identified as a barrier to adopting a pollution prevention perspective, then from another point of view this presents a challenge to design programs which exploit this psychological tendency on behalf of pollution prevention.

Cultural barriers to pollution prevention exist in government, business, and in American culture as a whole. Government agencies are typically regulatory, reactive, and single-medium focused rather than cooperative, proactive, and holistic in their outlook. History, tradition, reward structures, organization, and bureaucratic inertia may all contribute to resisting change. Similar barriers exist in the private sector. In addition, the pressure to satisfy regulators, managers, and stockholders can create an atmosphere which discourages innovation that does not immediately improve the bottom-line. Moreover, the pollution prevention community tends to focus on government and business to the exclusion of concerns about the general public. Yet, ultimately, changes in government and business will be closely associated with changes in popular outlook.

Shifts in these cultural barriers and facilitators have the potential for enabling enduring and comprehensive changes in patterns of human action. Despite their importance, of all the barriers confronting pollution prevention programs, cultural barriers are the least understood. Although they are complex, neglected and overlooked, overcoming these barriers is key to implementing a pollution prevention approach.

D. VALUES AND RESPONSIBILITY

Pollution prevention programs must overcome various cultural barriers if they are to be successful. One of these barriers concerns people's values. A successful pollution prevention program depends on people coming to value efficiency over excessive consumption, and its long-term success may even depend on people coming to value sufficiency over efficiency.

Any program whose success depends on a reorientation of basic values must be sensitive to charges of manipulation and exploitation. Governments and other powerful institutions have opportunities to create events and shape messages in misleading and manipulative ways. In implementing pollution prevention programs it is important to respect people as active information processors and knowledge users. People should not be viewed as laboratory animals to be manipulated in order to obtain some desired result. Indeed, if long-term success rather than merely the short-term modification of behavior is to be achieved, it is vital that people's values, beliefs, and reasoning become more reflective, and this requires treating them with respect. It is also important to recognize that pollution prevention does not require a radical revision of everyday values. Surveys show that environmental values are strongly held by many Americans. For many people the strongest motivator for pollution prevention will be concerns for children and community, values already deeply rooted in American life.

Rather than being autonomy-threatening, pollution prevention programs that have a long-term focus can contribute to people's autonomy and sense of responsibility. Many environmental problems have the character of collective action problems--widespread deleterious effects are brought about unintentionally by the tiny contributions of a great many people. Such problems occur in part because people feel alienated from their communities and the consequences of their actions; they persist because people feel powerless to change them. Pollution prevention strategies have the potential to empower people. People who are empowered are more

likely to see themselves as responsible actors. When people see themselves as responsible actors they are more likely to make a difference. For this reason a non-coercive pollution prevention approach has practical as well as moral value. Thoughtful, reflective citizens are more likely to produce long-term sustainable change than those whose motivations and concerns are short-term.

PART II: A SURVEY OF THE LITERATURE

From one perspective, it can be said that the literature that relates to cultural barriers to pollution prevention is overwhelming; from another perspective it is sparse. Researchers from a wide variety of disciplines have done work that may be thought to bear on some aspect of our problem, but very little work has been done that is directly focused on cultural barriers to pollution prevention. In these circumstances a review of the literature is inevitably impressionistic. Different researchers would probably emphasize different aspects of the literature. It would be foolish to expect complete agreement about what is important or to expect one review of the literature to be definitive.

One approach that we have used to some extent is to look at literature that examines behavior that appears to be analogous to pollution prevention behavior. Recycling is generally not considered a core pollution prevention behavior, but we have proceeded on the assumption that important insights can be gained from looking at the literature which examines recycling. In a more limited way we have examined the literature on smoking and seat belt use. Although we believe that insights can be gained here, thus far we have been disappointed in much of what we have found.

In addition to the problem of determining exactly what literature is relevant to the project, a further problem lies in trying to synthesize the literature that has been identified as relevant. Even when questions are closely related, different researchers often focus on different aspects of problems. Concepts are used in different ways and different models are employed. These differences make it difficult to compare results directly. When the literature is read from a problem-oriented perspective, the fault lines that separate disciplines and research traditions emerge very clearly.

As a result of this fragmentation, the best way to use the

literature for policy purposes is to read it suggestively. Much of the literature is quite rich when approached in this way. While few definitive conclusions apply directly to cultural barriers to pollution prevention, many insights are articulated that can be extended and modified, so long as caution is observed.

A. METHODS, CONCEPTS, AND MODELS

Since the sources that we draw on are quite diverse, different methods, concepts, and models are employed.

1. Methods

Four basic methods are employed in the literature that we surveyed.

a. Surveys

Survey research typically involves mailing questionnaires to selected populations, or in some cases administering questionnaires by telephone or in interview settings. Some surveys attempt to measure attitudes or levels of concern, while others ask subjects to self-report relevant behavior. Occasionally these studies are supplemented with an observational component. For example, some studies have involved observing the behavior of people who claim to participate in recycling programs. Political scientists and sociologists often study behaviors such as voting, letter-writing and so on, while studies of conservation behavior are typically done by psychologists.

b. Behavioral Experiments

A second approach is to use behavioral experiments. Situations are manipulated in such a way that significant variables can be controlled. On the basis of various correlations, claims can be made about the determinants of behavior. Increasingly behavioral experiments employ causal modeling or regression analysis.

c. The Ethnographic Method

The ethnographic method presents open-ended questions to subjects in an interview format. This approach can sometimes elicit information that would not be made available using other methods. This approach is especially valuable when used in conjunction with other methods. Because it is extremely labor-

intensive, it has not been used as frequently as other methods in the literatures that we have reviewed.

d. The Synthetic-Analytic Approach

Some of the most valuable contributions to the literature have involved reviewing empirical studies and trying to integrate them into a larger framework. Such attempts sometimes bring out interesting data that have been neglected or show that some of what we thought we knew may not be so certain after all.

2. Concepts

One of the difficulties in coping with the literature that bears on cultural barriers to behavior change is that researchers use different words for the same concepts and refer to different concepts with the same words.

There are many reasons for this. The relevant literature is found in different academic disciplines and subfields, each with its own research traditions and vocabularies. In addition, contemporary social scientists have been strongly influenced by behaviorism and positivism and, as a result, often seem uncomfortable with the language of values.

In an effort to simplify this discussion we will identify seven factors that affect behavior: beliefs, desires, attitudes, values, emotions, patterns of reasoning, and mental models. Depending on how these factors are functioning, they can either facilitate behavior change or be a barrier to it. While these concepts apply most naturally to individuals, they also apply to such institutions and collectives as corporations, clubs, churches, and interest groups.

In developing this vocabulary we are building upon the literature. But since the literature is conceptually fragmented and inconsistent, the development of this vocabulary is to a great extent a constructive task.

These seven features that we will discuss can be thought of as occurring at different levels in an individual, society, or culture. Beliefs, desires, and emotions are most immediately connected with behavior. Values and attitudes underlie and help to

generate or rationalize particular beliefs, desires, and emotions. Mental models provide the framework in which these features are embedded. Patterns of reasoning affect the perceived relationships between these elements and can also produce new beliefs or values.

a. Beliefs, Desires, and Emotions

Beliefs are representations that reflect how someone takes the world to be. Such statements as "driving contributes to climate change" and "new refrigerators are more energy-efficient than old ones" reflect beliefs that a person may have.

Desires reflect goals that people seek to realize. For example, people may desire more energy-efficient appliances, faster cars, or less government regulation.

On one standard account, an action is produced by the conjunction of a belief and desire. If a person desires some end E and believes that A is a means to E, then everything else being equal the person will do A. For example, if a person desires energy-efficient appliances and believes that new refrigerators are more energy efficient than old ones, then everything else being equal the person will try to replace an old refrigerator with a new one.

This example can also be used to show how an action can go wrong. If a person believes that old refrigerators are more energy efficient than new ones, then this person may seek to hold on to the old one at all costs in the service of energy efficiency. An action may be based on a false belief.

The beliefs we hold may be false, or taken together they may be inconsistent. There may also be important features of the world about which we have no beliefs. Similarly our desires can be inconsistent. A person may want both a large, fast car, and one that is energy-efficient. At least today, these desires are in conflict with each other.

Unlike beliefs, desires are neither true nor false. If one person wants a Ford and another a Chevrolet they desire different cars, but it is not the case that one desire is true and the other false. Economists typically believe that desires should be taken

as given: that there is no ground for saying that one desire is better than another. Other theorists have argued that desires can be irrational, pathological, or rooted in false consciousness.

Even if we have beliefs and desires that incline us toward an action, our relevant beliefs are true, and our desires are consistent, we still may fail to act. Our desire may not be a very strong one, or certain facts about our environment may inhibit the action (we don't have enough money, our friends would disapprove, we'd lose our job if we did it, and so on.).

Emotions also appear to play a role in generating or inhibiting action. We may fail to do something that we would otherwise do because we would feel ashamed if we did it (e.g. litter). Love or anger may lead us to feel passionately about performing an act and therefore raise the probability of our doing it.

There is a great deal of controversy in the psychological and philosophical literatures about the nature of emotions. On some accounts they are purely affective, on others they have cognitive dimensions as well, and some see them as being socially constructed. Whatever the nature of emotions, it seems plausible to think of them as bearing on which combinations of beliefs and desires issue in action. Indeed, emotions can be so powerful that they may even lead us to act against our desires or in circumstances in which we believe our actions would be futile.

b. Attitudes and Values

Whether or not desires can be evaluated, it is important to ask why people have the desires that they do. If we cannot say that people have the desires that they do because they are the best desires for them to have, then the question becomes all the more difficult.

The same question can be asked even about beliefs. The role of a belief is to represent the world. To some extent people have the beliefs that they have because the world is the way that it is. But many beliefs involve highly complex matters of interpretation. In other cases we are comfortable in holding our beliefs and

dismiss contrary evidence or try to avoid confronting it. In still other cases we have no beliefs because, for whatever reason, we do not take an interest in forming beliefs in this area.

These considerations suggest that mechanisms underlying our beliefs and desires play a role in determining which beliefs and desires we have. This is the role of attitudes and values.

The literature often conflates attitudes and values, but it is useful to distinguish between them. Roughly we can say that an attitude is a deep disposition that guides someone in forming beliefs and desires. For example, an attitude may lead a person not to seek information provided by the government or to disbelieve it when it is presented. An attitude may also incline one to have certain desires or ends rather than others. For example, a generally positive attitude toward wilderness may incline one to go camping or backpacking.

Values are more reflective than attitudes, and to some extent they are backed by reasons. A person may have an attitude that affects his or her beliefs, desires, and actions without being consciously aware of having that attitude. Or the attitude may simply be experienced as a subjective fact--part of what it is to be that person, in much the same way that we experience our hair and eye color, and other facts about us over which we have little control. People are often unwilling or unable to justify attitudes; indeed, often we think that a request to justify an attitude is entirely out of place. Values, on the other hand, are more likely to be the objects of reflection, and to some extent values can be supported by reasons.

Part of why attitudes and values are conflated in the literature is because one and the same stance can reflect an attitude in one case and a value in another. Imagine two people, one who has a pro-wilderness attitude and one who has a pro-wilderness value. For the first person this pro-wilderness stance is unreflective. A disposition to form pro-wilderness beliefs and desires is simply part of what it is to be this person. This person cannot justify this stance and may even think that a request

to do so is out of place. The second person, on the other hand, is able to produce reasons, arguments, and evidence for her view about wilderness preservation. The commitment to wilderness preservation may play the same role in generating beliefs, desires, and actions for both people, but in one case it is an attitude and in the other case it is a value.

This distinction between attitudes and values is potentially of great importance because the mechanisms that sustain and change attitudes and values may be very different. To some extent values are affected by cognitive considerations; persuasive, noncognitive attempts to influence them may be seen as irrelevant or may even have the effect of hardening them. Attitudes, on the other hand, may be impervious to cognitive appeals because they are not based on reason. Insofar as attitudes can be changed it is by altering their internal and external environments, rather than by combatting them with information.

c. Mental Frameworks and Patterns of Reasoning

Beliefs, desires, attitudes, and values are all elements in a broad framework that structures our experience of the world. To some extent this framework is biologically constrained. Given the sorts of animals that we are, visual information is more salient for us than olfactory information, and certain occurrences in the world do not figure in our thinking at all because they fail to produce changes to which our sensory systems are sensitive. Compare our reactions to toxic waste sites that offend our eyes and nose with our reactions to radon.

In addition to the contribution of biology, mental frameworks are to a great extent culturally and perhaps even individually constructed. This can be seen by the cultural relativity that exists with respect to a wide range of issues.

The investigation of mental models is in its infancy,. and disagreement is rampant about how they should be represented. For example, some argue that mental models are fundamentally computational, while others argue that they are connectionist systems. But however these models are represented, some

interesting features of them have come to light.

For example, there is evidence that many concepts are represented in our minds in terms of the properties that are most salient or frequently experienced, rather than by rules specifying necessary and sufficient conditions for their application. A collection of salient properties is called a prototype. On this view something is characterized as an instance of a concept if it is "similar enough" to the prototype of the thing in question. The prototype view may help to explain the apparent conservatism of our mental models. It is striking that new information is often assimilated to what we already believe. On this picture we categorize new information by assimilating it to an already existing prototype.

In addition to having mental models we also perform operations on our beliefs that result in new beliefs. These operations can be thought of as patterns of reasoning. In recent years they have been intensively investigated, and various biases in our reasoning have been discovered. For example, people tend to overestimate the probability of a probable event and underestimate the probability of an improbable one. We tend to overestimate the probability of an event that we have recently witnessed and underestimate the probability of one we have not. Experts tend to overestimate their expertise.

All of us hold beliefs that are true and also beliefs that are false. We have a multiplicity of desires, a plurality of attitudes, and a host of diverse values. Any attempt to overcome cultural barriers to pollution prevention behavior must confront the reality of our existing mental models.

3. Models

The literature that we have reviewed contains a number of different conceptual models and research traditions. The behaviorist tradition remains strong in some academic circles, and research is still being conducted that seeks to explain and predict behavior by associating it with various external stimuli. Other researchers study the growth of environmentally friendly behavior

in a population by modeling it on the diffusion of technology. However, two families of models have been especially influential: the rational choice model and the attitude model. Each model rests on a simple and intuitively plausible idea. The basic idea behind the rational choice model is that people's behavior is determined by their interests. The attitude model supposes that people's actions are caused by underlying positive or negative dispositions toward the results of these actions.

a. Rational Choice Models

Rational choice models of conservation behavior are inspired by models prevalent in microeconomic theory. These models imply that people are rational actors who always act in their own interests, so long as certain conditions are satisfied (e.g., they have perfect information, there are no transaction costs, and so on). If people behave in a way that is socially deleterious it is because it is in their interests to do so or the conditions on rational action are not satisfied. In order to change people's behavior so that it produces socially preferred outcomes, either these conditions must be satisfied or incentive structures need to be changed so that people's individual interests are aligned with the public good.

Although the application of rational choice models to conservation behavior has produced important insights, these models have been criticized. Important conceptual objections to these models argue that they are circular or empirically false. In addition it has been argued that these models collapse a wide range of psychological phenomena--values, beliefs, attitudes, and so on--into the category of self-interest. Indeed, one striking empirical result is that, contrary to what rational choice models might predict, providing people with information or changing incentive structures frequently does not have the desired results. Incentives need to be understood in order to be effective, and information must be interpreted; values, prior beliefs, mental models, and so on greatly affect this understanding and interpretation.

These problems and limitations have led some researchers to adopt alternative models. Even some economists are experimenting with models that provide more psychological texture than rational choice models.

b. Attitude Models

Attitude models rest on the assumption that attitudes cause behavior. The concept of an attitude has not always been adequately characterized. Moreover, studies frequently fail to discover a strong, direct, or consistent relationship between attitudes and behavior. This suggests that insofar as attitude models are plausible, the relationship between attitudes and behavior is neither simple nor direct.

In recent years several different attitude models have been developed. These models attempt to fill the gaps between simple attitudes and behavior. While none of these models is successful for every sort of case, they draw our attention to important influences on behavior. Many more of these models have been developed than we can discuss (Rokeach 1973, Ajzen and Fishbein 1980, and Gray 1985 have been especially influential). Here we briefly review three of them.

i. A Causal Model of Environmentally Relevant Behavior

Stern and Oskamp (1987) developed a model in which individual behavior is a product of psychological variables (e.g., attitudes), interpersonal variables (e.g., communication), situational structures (e.g., community size), and contextual factors (e.g., demographic background). Attitudes and behavior are strongly correlated when both are measured at the same level of specificity and when behaviors are easy to perform. The model incorporates feedback loops in order to account for learning and self-justification.

	Level of Causality	Type of Variable	Examples
	8	Background factors	Income, education, number of household members, local temperature conditions
	7	Structural factors	Size of dwelling unit, appliance ownership
		Institutional factors	Owner/renter status, direct or indirect payment for energy
	6	Recent events	Difficulty paying energy bills, experience with shortages, fuel price increases
	5	General attitudes	Concern about national energy situation
		General beliefs	Belief households can help with national energy problems
	4	Specific attitudes	Sense of personal obligation to use energy efficiently
Self-Justification		Specific beliefs	Belief that using less heat threatens family health
		Specific knowledge	Knowledge that water heater is a major energy user
	3	Behavioral commitment	Commitment to cut household energy use 15%
Learning		Behavioral intention	Intention to install a solar heating system
	2	Resource-using behavior	Length of time air conditioner is kept on
		Resource-saving behavior	Insulating attic, lowering winter thermostat setting
	1	Resource use	Kilowatt-hours per month
	0	Observable effects	Lower energy costs, elimination of drafts, family quarrels over thermostat

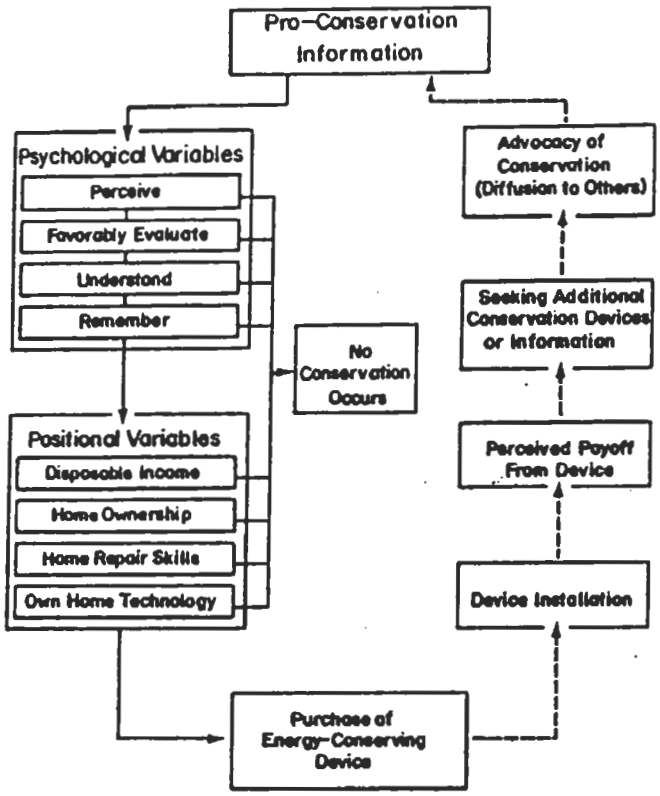
*Source: Stern & Oskamp 1987

This model is interesting because it identifies some important factors that bear on behavior, and it also acknowledges the fact that causal factors can be both proximate and distal. However, some of the basic concepts need further refinement, and in attempting to provide a causal theory the model is very ambitious and open to various counterexamples.

ii. A Psychological-Social Model of Energy Conservation Behavior

Costanzo et al. 1986 have developed a model for explaining and predicting the behavioral effects of providing pro-conservation information. This model distinguishes two families of interacting variables: psychological variables and positional variables. Psychological variables concern how information is processed by individuals, while positional variables concern individuals' circumstances that support or constrain action. In order for information to become active on this model, it must be perceived, favorably evaluated, understood, and remembered. In order for this information to issue in action, positional variables such as disposable income must be favorable.

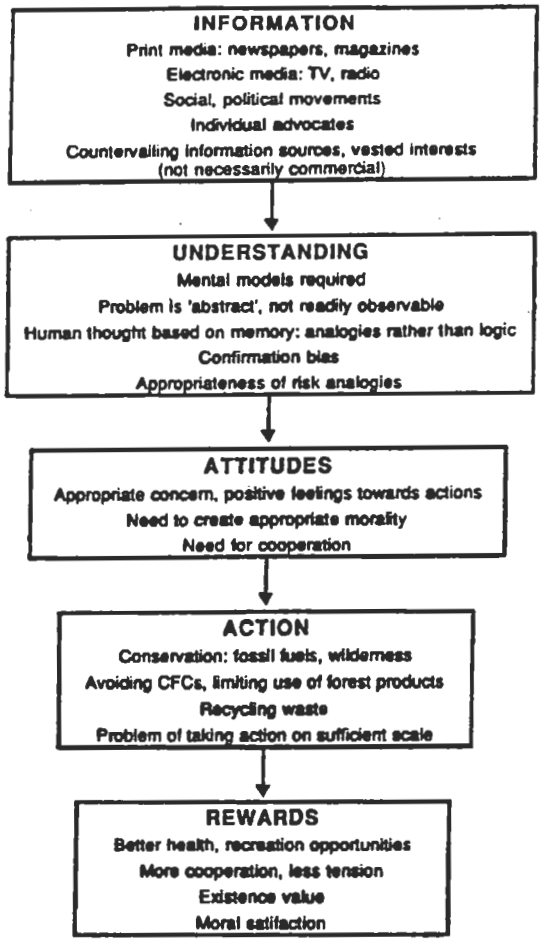
Psychological and Social Factors in Energy Conservation Behavior



Although this model specifically relates to the use of information, it explains both strong and weak correlations between attitudes and behaviors. Positional factors mediate between attitudes and behaviors and determine whether or not attitudes will be associated with appropriate behaviors in particular cases. However, this model may place too much weight on positional factors.

iii. A Decision-Making Model of Environmental Behavior

Halford (1990) has suggested a five-step decision-making model of how people arrive at environment-friendly patterns of behavior. On this model information, understanding, attitudes, action, and rewards are all essential for the production and maintenance of these behavior patterns. If there is a failure in any stage of the process, the desired behavior will either not occur or it will not be sustained.



Although this model identifies a number of important areas for further research, it is oversimplified in its present form. The failure to identify feedbacks among the five components is especially striking.

The models that we have discussed are all interesting and useful. It should be clear that no single model or research tradition dominates the literature. Work will continue employing different concepts and models.

While a diversity of research traditions is all to the good, it is troubling that often the concepts that are used are not very clear. Moreover, researchers use the same terms with different meanings and different terms with the same meanings. Communication across research traditions is a challenge in this area, as it is in so many areas of science.

B. SOME THEMES IN THE LITERATURE

Several fields have addressed the issues that are of interest to this project. This section reviews findings from social psychology, anthropology, sociology, marketing, business, and economics. Because their work is grounded in various disciplinary traditions, researchers from different fields often approach issues from different perspectives, employing different models and vocabularies. Moreover, the existing literature is strikingly uneven with respect to the problems that it addresses. For example, a great deal of research has been done on energy use, littering, and recycling, but much less attention has been given to the use of household products. Behavioral studies have been focused primarily on individuals and households rather than institutions and workplaces. Emphasis has been placed on relatively small day-to-day choices rather than major investment decisions. Relatively little attention has been paid to how one environment-friendly behavior may lead to others. Any attempt to survey and synthesize such a wide range of diverse literature is inevitably eclectic and impressionistic. For these reasons it is difficult to summarize some basic themes in a tidy way.

In general, institutional factors do not get the attention that they deserve in this literature review. The institutional factors that affect pollution prevention behavior are obviously very important. Changes in the culture of a corporation or in its competitive or regulatory environment can have a dramatic effect on people's behavior. However, the central focus of this literature review is on individual behavior. In part this reflects the preoccupations of the existing literature, but it also reflects the mandate of this project, which is concerned with identifying barriers to, and facilitators of, long-term sustainable change with respect to pollution prevention behavior. The cultural factors we discuss--beliefs, desires, emotions, attitudes, values, mental models, and patterns of reasoning--are relatively neglected, yet they provide the context for any long-term change. For these reasons they are our focus.

1. The Individual

We begin this review by looking at some themes that have emerged about how various individual attributes may affect pollution prevention behavior.

a. Demographic Factors

A great deal of research has been undertaken to determine whether various demographic variables, for example age or level of income, predict consumer-related characteristics such as media preference (Vining and Ebreo, 1990). While correlations have been discovered that are useful in making such predictions, demographic factors have been far less useful in predicting environmental concern or the likelihood of environmentally responsible behavior. Although some relationships have held up on occasion, definitive conclusions are difficult to find. Part of the problem is the complexity of the subject. Environmentally responsible behavior forms a large and diverse class, some members of which may be correlated with some precisely defined but ungeneralizable demographic features.

Some weak correlations that have been reported are the following:

1) age - which has a negative correlation with environmental concern (Mohai and Twight, 1987; Hines, Hungerford, and Tomera, 1987; Van Liere and Dunlap, 1980);
2) education - which has a positive correlation with environmental concern (Hines, Hungerford, and Tomera, 1987; Van Liere and Dunlap, 1980);
3) liberal political ideology and higher socioeconomic status - which are sometimes found to have a positive correlation with environmental concern (Taylor, 1989; Van Liere and Dunlap, 1980).

The higher levels of activism found among people with higher levels of income were initially attributed to higher levels of concern; more recently, however, it has been claimed that higher levels of activism do not reflect higher levels of concern, but

rather greater access to resources (Taylor, 1989; Mohai and Twight, 1987; Mohai, 1985).

Likewise, while greater activism has been found among males than females and among whites than blacks, recent studies indicate that levels of concern are fairly equal between males and females and between blacks and whites, and the difference in levels of activism is now thought to reflect greater access to resources (Hines, Hungerford, and Tomera, 1987; Mohai, 1992; Stern, Dietz, and Kalof, under review).

b. Positional Factors

Although demographic factors are not strong predictors of environmental attitudes and behaviors, various positional factors that relate to one's situation or circumstances are. The greatest single factor which influences a major energy investment, such as the purchase of a new furnace, is home ownership (Black, Stern, and Elworth, 1985; Costanzo, et al., 1986). Home ownership has also been identified as a factor which influences recycling (Oskamp, et al., 1991). Other factors which predict the adoption of an energy-saving device include ownership of other home technologies and a household member who is able to perform repairs (Costanzo, et al., 1986).

c. Attitudes

Specific attitudinal factors have been found to be better predictors of other attitudes than are broader belief systems (Oskamp et al., 1991; Samdahl and Robertson, 1980). Attitudes and past behavior can influence present behavior (Harris, Miller, and Reese, 1992); and those attitudes which are most closely related to a person's basic values are those which are most likely to be carried into behavior (Stern and Oskamp, 1987).

d. Mental Models

Mental models are essential for organizing our experience of the world. They provide rules of thumb, shorthand explanations, and useful heuristics that help us to deal with new or difficult situations.

In order to fulfill these functions successfully, mental

models are intrinsically conservative. We model novel experiences on the basis of old ones, and we assimilate new technologies to ones with which we are already familiar. Kempton (1987) has shown how people model thermostats as valves or feedback devices, and this affects how they use them.

The conservatism of our mental models gives rise to "conforming attitudes." An individual's broad general attitudes can affect his or her attention to and belief in information that is presented (Stern, Dietz, and Black, 1985-86). If information deviates too far from what people already believe, it is often discounted or ignored (Burn and Oskamp, 1986).

This disposition to pay attention only to what we already believe may lead to another phenomenon. When presented with information that does not appear to conform to what we already believe, we tend to shape the new information so that it does conform to our previous beliefs and commitments (Kempton, 1987, 1990).

We can be quite selective as to what beliefs we admit to our belief system. For example, if someone forms the belief that an energy-saving device is difficult to operate, this may influence the decision whether or not to obtain that device more than how well the device does what it is meant to do (Darley, 1977-78; Darley and Beniger, 1991). This is an example of how changes in our beliefs can affect our desires (Tversky and Kahneman, 1981).

e. Attitudes Toward Risk

It is clear that people have different attitudes toward risk. This can affect our disposition to engage in pollution prevention behavior by leading us either to discount or to magnify the probability of pollution-caused harm. The subject of risk is a large one, and an extremely large literature has been produced which addresses it. Indeed, there is a large society (the Society for Risk Analysis) that studies risk, and it publishes its own journal (*Risk Analysis*). We shall note only several points here.

First, not only are there different attitudes toward risk across individuals, but different clusters of people have different

attitudes toward risk. For example, experts and nonexperts have been shown to have different attitudes toward risk. Among the facts that seem to affect people's attitudes toward risk are the following (for further examples see Kahneman, Slovic, and Tversky, 1982):

1) the increased noxiousness of risks leads to the amplification of risk (Hass, Bagley, and Rogers, 1975);
2) harms that are more than 10 to 15 years away are heavily discounted (Jeffery, 1989);
3) health risks we pose to ourselves are systematically discounted (Jeffery, 1989).

Second, opinions differ regarding the relevance of the literature on risk to problems of pollution prevention. It can be argued that pollution prevention and risk analysis are alternative paradigms and that the case for preventing pollution does not rest on the assessment of risks. Some risk analysts, on the other hand, argue that the only case for preventing pollution is that it exposes people to risks.

f. Values

No single, global value has been found to predict general environmental concern nor to correlate strongly with general pro-environmental behavior (Oskamp, et al., 1991). Further, no general view of the energy problem is associated with reported energy conservation behavior (Olsen, 1981). Buttel and Johnson (1977) have suggested that environmental concern is multi-dimensional; thus it may not be possible to generalize from the determinants of one environmentally responsible behavior to another (Tracy and Oskamp, 1983-84). This suggests that we need to examine specific environment-friendly behaviors in detail (Oskamp, et al., 1991; Stern, 1986; Stern and Oskamp, 1987; Buttel, 1987).

Although there is no single value associated with environmental concern, a number of different values appear to be related to it. These include:

1) self-interest (Kempton, 1990);
2) future generations in general and one's

own descendants in particular (Kempton, 1990);

3) human welfare in general (Dunlap and Van Liere, 1977);

4) nature in general (Heberlein, 1972).

De Young (1988, 1990-91) has done research on what he calls "satisfactions." A satisfaction is a benefit one obtains by acting. In particular cases, satisfactions may or may not provide reasons for acting. De Young (1986) has found that the following satisfactions are correlated with environmentally responsible behavior:

1) frugality (the careful use of resources);

2) self-sufficiency or self-reliance;

3) participation;

4) quality of life (De Young, 1986 and 1990-91).

These satisfactions are independent. One can derive satisfactions from both frugality and quality of life when performing a single behavior.

One observation about values that is prompted by De Young's work is this. Conservation has been derided as "being too hot in summer and too cold in winter." De Young's work shows that there are satisfactions that can be obtained from acting on the basis of our values. Indeed, the American tradition of valuing a simple, self-reliant life may have the makings of an important pollution prevention value.

One important question about values is how they make themselves felt in behavior. Schwartz and his collaborators have developed a model of how norms are activated and shown that norms can influence behavior (Schwartz and Fleishman, 1978). On this view personal norms, which are constructed from one's general value system, generate a sense of obligation to act in a particular way in a specific situation. According to this view, when people feel personally responsible and are aware of the consequences of their actions, they often behave according to moral norms even when this conflicts with economic considerations (Heberlein, 1972). Norm activation theory also suggests that action depends not just on the belief that something ought to be done, but also on the belief that

one's actions can make a difference (Stern, Dietz, and Black, 1985-86).

2. Social Milieu

Individual behavior is embedded in a social framework, and social factors play an important role in affecting what we do.

Most people have a highly differentiated web of social relationships. Some relationships, such as those with friends and family members, are highly valued. People often modulate their behavior in response to the opinions of those whom they love and care about. The more valuable the relationship, the greater the influence other people can exert upon us.

However, even someone who is not in a valued relationship with us can exert a strong influence. The block leader system has been a very successful approach to recycling. Burn (1991) suggested that this approach is successful either due to the block leader's own behavior modeling, or to the incentive provided by the recognition of one's behavior by others. Another study of recycling suggests that the social interaction provided by a block leader influences behavior less directly than modeling, and that the block leader's behavior can initiate the establishment of social norms that tend to enforce behavior independent of the block-leader's own behavior (Hopper and Nielson, 1991). Earlier the importance of behavior modeling was demonstrated by Aronson and O'Leary (1982-83).

Social norms and community expectations are clearly important in sustaining a pattern of behavior. Even if a person is not closely linked to a community, the prevailing norms and expectations may still bring the person's behavior into conformity with community values.

Increasingly people's networks of relationships are growing to encompass not only those with whom they have a direct connection, but also people they see on television or hear on the radio. These people can also serve as example-setters.

3. Facilitators and Barriers

Various factors enable or inhibit the performance of

environment-friendly actions. These include the following.

a. A Sense of Efficacy

A sense that one's efforts make a difference in producing a desired result is an important factor affecting behavior. Samuelson and Biek (1991) found that the belief that one's actions make a difference is one factor that underlies positive attitudes toward reducing energy. Bandura and Cervone (1983) have shown that a sense of efficacy can lead to renewed efforts to address a problem when an individual knows that he or she is capable of doing more than he or she has already done.

Groups interact in important ways with an individual's sense of efficacy. While an increased sense of efficacy can motivate someone to join a group (Cook, 1984), we tend to feel more efficacious as individuals within a group when the group size is small (Kerr, 1989). What beliefs we hold about the structure of the group and its processes also affect our assessment of the efficacy of a group. It is the sense of collective efficacy rather than self-efficacy that affects an individual's belief that a group will be able to solve a problem through a collective effort (Kerr, 1989).

The importance of a sense of being able to make a difference has interesting connections to norm-activation theory. Hines, Hungerford, and Tomera (1987) found that environmentally responsible behavior is associated with a sense of responsibility. The acknowledgment of responsibility involves the belief that one ought to do something about a problem. The belief that one ought to do something about a problem in turn is associated with the belief that one can do something about the problem (Stern, Dietz, and Black, 1985-86; it is interesting to note that the 18th century German philosopher Immanuel Kant thought that having a moral obligation implied being able to fulfill it).

While a sense of efficacy can be an important facilitator of action, a sense of powerlessness can be an important barrier. The extreme example of this is when there seems to be no relation between one's actions and outcomes. The result can be a feeling of

helplessness that leads to loss of motivation or even depression.

b. Public Commitment

Public commitment established through public statements has been found to increase the probability of actions consistent with these statements (Burn and Oskamp, 1986). Another study found that gaining a commitment from individuals increased the frequency and degree of a behavior; there seems to be a correlation between the strength of the commitment and the level of output. Further, those individuals who had made a commitment initially continued to engage in that action even when the period covered by the commitment had ended (Pardini and Katzev, 1983-84). Public commitment, in the sense in which it is understood in these studies, involves a face-to-face social interaction.

c. Rewards

Many studies have tracked the results of the use of rewards for conservation behavior, such as recycling, littering, and alternative transportation use. It has been found that although there is generally a short-term increase in the probability of the rewarded action, the probability of the behavior returns to its original level or ceases entirely once the reward is discontinued (Witmer and Geller, 1976; De Young, 1986). The cost of maintaining rewards for conservation behavior can be prohibitive--even greater than the savings they generate (De Young, 1986). In a bus ridership study, Backman and Katzev (1982) concluded that although providing rewards for desired behavior had some success, this approach did not produce results that were any better than those produced by the less costly means of securing public commitment to follow a course of action (also, Katzev and Pardini, 1987-88).

Large rewards can actually reduce the long-term probability of a desired behavior. When a behavior is heavily rewarded, an individual may come to think that the reward is his or her motivation for the behavior, even if the individual had previously engaged in the behavior and believed that it was important. When the reward is withdrawn, the individual may discontinue the behavior on the ground that the reason for performing the action no

longer obtains (Katzev and Pardini, 1987-88).

As one would expect from learning theory, studies have indicated that rewards distributed on a probabilistic basis, such as a lottery system, generate a greater increase in the probability of a desired behavior than rewards that are distributed in a predictable way (Jacobs and Bailey, 1982-83; Diamond and Zoewy, 1991).

Again, as one would expect, rewards are generally more effective than punishments in increasing the probability of a desired behavior. Moreover, in some cases the provision of positive incentives may generate positive attitudes toward a desired behavior, and this can lead to the establishment of a value or norm that fixes the behavior for the long term (Geller, 1983). The provision of rewards may also motivate individuals to overcome barriers, such as fear or lack of information, that prevent some action (Bachman and Katzev, 1982).

d. Coercion

If responsibility and choice are at one end of the spectrum, then coercion is at the other. Some researchers claim that there is an element of coercion in strategies such as distributing fear messages about unwanted behavior, or establishing monetary and social disincentives for their performance. However, generally by coercion we mean a strategy that punishes an unwanted action or omission.

The literature on coercion that is relevant to this project mainly concerns the backlash that coercive policies often produce. In one study, housewives who felt forced to change detergents were less positive about the new detergent than those who believed that they had a choice between them (Mazis, 1975). Coercion can reduce the desire for the behavior that is being sought, and increase the desire for the forbidden alternative (Brehm et al., 1966). If even a few people react negatively to a mild strategy, such as providing reminders to do something, it has the potential to nullify any gains made by those who comply with the prompt's request (Aronson and O'Leary, 1982-83).

e. Shame and Embarrassment

The inducement of shame and embarrassment has some similarities to coercion. However, shame is a self-imposed punishment while embarrassment is societally imposed (Grasmick, Bursik, and Kinsey, 1991). An individual's own assessment of the consequences of an action that produces shame or embarrassment appears key to evaluating its effects.

f. Personal Experience

Personal experience can have a dramatic effect on the probability of performing a behavior. Kempton (1990) speculates that one factor which may motivate people to support protection of the environment is that they have had personal experience with environmental degradation. For many Americans pollution is not an abstract problem but an experiential part of everyday life. To be effective, however, experience must be interpreted and understood. Experience of pollution may incline people toward environmental protection, but experience with efforts to prevent pollution may, in some cases, incline people in the opposite direction.

4. Information Provision

The provision of information is frequently used in attempts to facilitate action. A great deal of evidence indicates that the effectiveness of such programs is often overrated.

There are many reasons why it would seem to make sense to rely on information provision as a means for changing behavior: it is relatively inexpensive, fairly convenient, and large numbers of people can be reached with relatively few resources. Nevertheless, as a means for producing results, the simple provision of information has been shown to have a limited effect on behavior (Ester and Winett, 1981-82; Stern and Aronson, 1984; Costanzo, et al., 1986; and Kempton, et al., 1985). This much seems undeniable: there appears to be no clear causal relationship between the provision of information and behavior change.

There are probably many reasons why information provision fails to change behavior. Aronson and O'Leary (1982-83) suggest that when lifestyle changes are involved, information provision is

too weak; modeling behavior is required to effect such dramatic changes. In many cases information is ignored or interpreted in such as way as to reinforce prevailing attitudes, values, beliefs, and desires.

Despite these problems, measures can be taken to make information provision as effective as possible. One way to identify these measures is to put oneself in the place of the recipient of the information. We can ask the question: What are the attributes of information that make a difference to me? Many different answers can be given to this question. But part of what makes a message effective is its salience, utility, and persuasiveness. In addition, information that provides feedback about the recipient's behavior appears to be especially effective.

a. Salience

Information which is salient is more likely to be effective than information which is not. Messages that are specific, vivid, and personalized are more likely to be salient than those that are not (Ester and Winett, 1981-82; Stern, 1986; Geller, 1989).

Earlier we noted that specific attitudes about energy use are more likely to be associated with relevant behaviors than general attitudes. Similarly, messages that relate to a specific pollution prevention behavior are more likely to be effective than those that are general.

A vivid message is one that relies on pictures, modeled behavior, or narrative. These messages are more effective than carefully written, lawyerly communications.

A personalized message is one that appears to the recipient to be relevant to his or her life. Research indicates that people who anticipated experiencing direct personal consequences from energy problems were more likely to take action to save energy (Olsen, 1981; Stern, 1991). Similarly if information makes reference to a group with which the recipient identifies (e.g., the middle class, homeowners, African-Americans), the message is more likely to be effective.

b. Utility

Several studies of recycling have demonstrated the importance of utility if information is to be effective. De Young (1988-89, 1990, forthcoming) has shown that it is at least as important to provide information about how to recycle as information about why we should recycle. In one study recyclers and non-recyclers had roughly the same attitudes toward recycling, but their level of knowledge about <u>how</u> to recycle was significantly different (De Young, 1988-89). Another study found that recyclers were better informed than non-recyclers about how to recycle and about local recycling programs (Vining and Ebreo, 1990). Hines et al. (1987) found that two of the variables associated with responsible environmental behavior were knowledge of the issues and knowledge of specific action strategies.

Although it appears from these reports that providing useful information may be important to the effectiveness of a message, this could be called into question. We may wonder why the non-recyclers have less knowledge about recycling than the recyclers. This may have little to do with the information that has been provided the non-recyclers. The non-recyclers may have a positive attitude toward recycling, but have reasons other than lack of information for not taking part in this activity. Since they do not recycle, they may simply ignore information about how to recycle.

This suggests another aspect of what it is for information to have utility. This aspect is quite obvious, but it is sometimes ignored. If information about polluting behavior is to have utility for a person, then the person must see him or herself as having viable alternatives to the polluting behavior. If people believe that they have no realistic alternative to the continued use of a product packaged in a plastic container, then they will not see information about plastic recycling as having utility (Tracy and Oskamp, 1983-84; Van Liere and Dunlap, 1978).

c. Persuasiveness

Marketing theory suggests that in designing a persuasive

message it is important to know what information the intended audience already has, and whether people are likely to be favorable to receiving the information (Geller, 1989; Stern, 1986; McQuail, 1987).

Energy conservation campaigns in the past have sometimes provided the wrong information. The assumption has sometimes been made that the behavioral barrier to overcome was that of convincing the public that the energy crisis was real. But studies indicate that belief in the legitimacy of the energy crisis does not correlate with energy consumption (Becker et al., 1981; Seligman, Darley, and Becker, 1977-78). People who believe that the energy crisis is real use just as much energy as those who dismiss it. What does correlate with energy consumption is a desire for comfort and heath (Samuelson and Biek, 1991). People for whom comfort and health is important use more energy.

This shows that for many people energy conservation is associated with sacrifice (Becker et al., 1981). In many people's minds energy conservation is identified with cutting back on energy consumption, and making do with less. This leads to an emphasis on curtailment actions (e.g., turning thermostats down) and a relative neglect of investments in efficiency (e.g., purchasing energy efficient appliances). Yet this latter strategy may result both in reducing energy consumption and delivering the same services more economically (Black, Stern, and Elworth, 1985; Kempton et al., 1985).

It is not only the content of a message that affects its persuasiveness but also its source. Indeed, the credibility of the information has been a problem with some energy efficiency campaigns (Stern and Aronson, 1984).

According to a CNN/*Time Magazine* poll, environmental organizations are regarded as most credible with respect to information about the environment, government is next, and business is last. Stern (1986) discusses a case in which brochures describing how to save energy were mailed to apartment dwellers. Half the brochures were mailed with letters from the state public

service commission and the other half with letters from the local electric utility. The information mailed by the electric utility had no effect, while that sent from the state public service commission resulted in a 7% energy savings.

Friends and relatives are seen as more credible information sources than any institutions (Costanzo et al., 1986). Product information provided by friends and relatives is more effective than information provided by independent experts (Darley and Beniger, 1991).

d. Feedback

Feedback about our own behavior can be a very effective form of information. One study found that providing immediate feedback to homeowners reduced their daily use of electricity (Seligman and Darley, 1977). Feedback serves to give people cues about what works and what does not. It may also serve to motivate an individual to stick with a task, and it helps to focus attention on the behavioral objective (Seligman, Darley, and Becker, 1977-78). Interestingly, one study which did not find feedback effective speculated that this was because the participants did not view the feedback as credible.

Despite the potential for feedback to be an effective form of information provision, much of the information that we receive about our own environmentally related actions is limited, misleading, or difficult to understand. Many energy bills, for example, provide monthly totals with no indication of what the particular costs are that comprise the total. To make matters worse, we are often bad judges of our own energy usage. We tend to overestimate the energy costs of such visible appliances as television sets and underestimate the costs of such invisible ones as home heating systems (Kempton et al., 1985).

PART III: WHAT WE CAN DO NOW

The investigation of cultural barriers and facilitators to pollution prevention behavior is a relatively new activity. Although it builds upon previous studies of human behavior, it is a complex area in which much still remains to be learned. Very little can be said to be known with certainty. At the same time it is possible to make recommendations which may be valuable in guiding the efforts of those states and others who work in pollution prevention. The following are some recommendations that we have developed based on what we have learned from analyzing the literature and from interviews with a variety of people active in pollution prevention. These are general recommendations based on our research and our best guesses. Because they are general they cannot be applied mechanically. They will be most useful when applied with the insight and sensitivity of those who work in particular programs and who know what their own specific needs are.

1. Rewards and Incentives May Not Be As Effective As Values in Sustaining Behavior over the Long Term

The provision of incentives can be quite costly in terms of time and money and in some cases can be ineffective in changing behavior. For example, in a number of cases incentives have not substantially influenced people to recycle. In some cases in which the provision of rewards has been effective in changing behavior, the desired behavior ceases once rewards are no longer provided. This suggests that incentives should be used in a carefully targeted way. The provision of incentives may be most effective as part of a program that is directed toward developing values which would sustain the desired behavior over the long term. For example, economic incentives are more likely to contribute to lasting change in the way that a corporation does business if they are used to reinforce, rather than to replace, the corporation's own efforts to implement pollution prevention through changes in its corporate culture.

2. Values That We Already Hold Can Be Powerful

Values that people already hold may be useful in supporting pollution prevention behavior. According to various surveys, many Americans already hold strong environmental values even though institutional and contextual barriers often prevent these values from being expressed in behavior. Pollution prevention programs can build on traditional values such as frugality, sufficiency, and doing more with less. Surveys also suggest that concerns about children and future generations are the most powerful motivators of environmentally responsible behavior. These values, along with traditional concerns for community, can be important pollution prevention motivators in business and corporate settings as well as in everyday life.

3. Specific Values May Be More Important in Generating Action Than General Values

Abstract, global environmental values (e.g., we should love and respect nature) are not very good predictors of specific environmental behaviors. People's bringing their own bags to grocery stores is more likely to be a result of their having an attitude or value that is directed toward this specific behavior than a larger value about the importance of environmental quality. Similarly, rather than trying to implement general environmental values in corporate and government cultures, it may be more effective to instill specific values regarding the institution's own behavior. An individual or corporation that is narrowly concerned to reduce its own specific polluting activities may be more effective than one that has large, abstract environmental commitments.

4. Knowing How to Prevent Pollution May Be As Important As Wanting to Prevent Pollution

The recycling literature suggests than many people may not be competent to engage in recycling behavior (they don't know what to separate, what or when items are collected, and so on). In many cases giving people knowledge they need to prevent pollution may be more important than convincing them that pollution prevention is

desirable. This may be especially true in the business community with respect to those pollution prevention activities which would make economic sense. Businesses may not take advantage of these opportunities because they may not know how. Similarly, in many cases government agencies may not be competent to engage in pollution behavior or to convey pollution prevention knowledge and values to other sectors of society.

5. How Information Is Presented Helps to Determine Its Effectiveness

People are more likely to pay attention to information which is vivid, personal, specific, and which they perceive as credible. People are more likely to remember information that includes specific illustrations about people with whom they identify. Context affects whether people pay attention to information. Hearing about the benefits of a product at a dinner party from friends is a more credible endorsement for most people than hearing about the same product in a paid advertisement. Reading about a community problem in a brochure handed to you by a neighbor typically has greater effect than reading about the same problem in a flyer anonymously placed on a doorstep.

6. The Credibility of Information Is Affected by Its Source

Information from friends and relatives is regarded as more credible than information from other sources. Environmental information from environmental groups is regarded as more credible than information provided by government. Environmental information provided by business is regarded as the least credible of all. Enlisting the help of environmental groups to provide pollution prevention information may be one way of making such information more credible. Once such information enters a person's network of friends and relatives, it may be effectively transmitted throughout that network.

7. New Information Is Understood in Terms of Old Concepts

In general, people are conceptually conservative. They tend to assimilate new information in such a way that it is consistent with the ideas and concepts they already have. People also tend to

resist forming new beliefs that are in conflict with old ones. Any attempt at communication must begin by recognizing and acknowledging the beliefs, attitudes, and mental models that people already have. For example, many people associate energy conservation with sacrifice and think of it as being contrary to health and comfort. This association might lead people to reject programs directed toward energy efficiency if they associate them with energy conservation. Thus, it may be difficult for them to believe that replacing an inefficient furnace will result in staying just as warm in winter, while saving both energy and money. Government agencies and corporations also tend to be conceptually conservative and to assimilate new ideas and information to old models and practices. This is part of the reason why, although there is a great deal of talk about progressive management in the private sector and reinventing government in the public sector, progress in implementing these ideas is often so slow and disappointing.

8. Stories, Anecdotes, and Analogies Can Be Powerful Resources

From the time we are children, much of our knowledge of the world is obtained through stories. An anecdote about how a company reduced its use of toxics or a homeowner began to compost can be much more effective than a set of abstract instructions or some qualitative data about the long-term effects of our actions. Analogies between pollution prevention and successful programs in such areas as public health (e.g., anti-smoking campaigns) and highway safety (e.g., seatbelt use) may provide important insights that transfer to pollution prevention. Stories, anecdotes, and analogies can be just as important in motivating and educating employees and officials as citizens.

9. It Is Generally More Effective to Work through Existing Communities or Groups Than to Build New Ones

Existing networks and organizations already have a base of support, membership, credibility, and an established position in a community. Pollution prevention may be more likely to succeed if it is adopted by existing groups such as families, churches, clubs,

neighborhood groups, and so on, than if it is the goal of newly established groups or organizations. Similarly, business and government pollution prevention may be more effectively carried out if it utilizes existing corporate or bureaucratic structures, whether they are internal or external to the agency or business.

10. Information about the Effects of Our Past Actions Influences Present Behavior

Specific feedback permits us to monitor the effectiveness of our behavior and to adjust it accordingly. Feedback also serves to increase and focus our attention on specific actions. Households which receive specific information about their energy usage are more aware of what they do that requires energy and are therefore better able to control their energy consumption. Energy bills often do not provide specific enough information for feedback to be effective because they generally lump together all energy costs and give consumers no way of knowing which actions result in what costs. Feedback can also provide a means of giving positive reinforcement for achieving energy savings. This is true both for individuals and businesses.

11. People Are More Likely to Act If Their Behavior Clearly Makes a Difference

There are a variety of ways of helping people to feel empowered, including organizing them around modest achievable goals, developing a community which can provide social sanctions and encouragement, and providing them with immediate, understandable feedback about their behavior. Part of the difficulty in motivating corporate and government actors may be due to a lack of a sense of efficacy on the part of those rooted in bureaucratic organizations. People who work in large organizations often feel powerless to achieve even modest goals. Specific, manageable goals that make a difference should be identified, and people should get adequate feedback about their efforts to reach them.

12. People Are More Likely to Act If They Feel Responsible for an Outcome

It is difficult to motivate pollution prevention behavior because everyone is a pollution prevention actor and therefore it is easy for each person to believe that someone else is or should be responsible. Generally in the environmental area citizens believe that government and business are the responsible actors, and therefore individuals often fail to acknowledge the importance of their own behavior and roles. Yet business and government are unlikely to take aggressive action without pressure from citizens. If pollution prevention is to be a priority within an organization or society, specific individuals must accept responsibility for the consequences of their actions. Another difficult is that the desired pollution prevention behavior is often seen as negative (e.g., don't drive your car, don't use paper or plastic), and it is difficult to motivate people not to perform an act. One approach to this is to describe pollution prevention behaviors as positive activities (e.g., walking, or bringing your own bag to the store) and encourage the performance of these alternative actions.

13. Public Commitment Makes People More Likely to Act

People make commitments either as an expression of a value that they already have, or the very act of making the commitment contributes to forming the value. Whichever is the case in a particular circumstance, making a public commitment is a way of taking on a responsibility. Those who make public commitments are more likely to act than those who do not, and they often carry through with the behavior beyond the period of time to which they have committed.

14. Role Models Are Important

People tend to follow the behavior that others around them model. People may participate in curbside recycling because most of their neighbors participate and they may feel peer pressure to do so, or modeling may be a way of demonstrating how recycling is done. For either or both reasons, role models are important. In order to get business to act aggressively, it may be important for government to be a pollution prevention role model. Similarly, the business community as a whole is more likely to act if they have

role models from within their own community. For these reasons, awards and other forms of public recognition may be effective.

15. Change Agents Are Important

Innovative values and behavior are typically diffused from a few individuals through a population. People acting as change agents can serve as advocates, consciousness raisers and communication links, familiarizing others with new ideas and patterns of behavior. Within organizations, individuals in leadership positions who champion pollution prevention are generally needed in order for pollution prevention to become part of the organizational culture. Similarly, pollution prevention programs have the potential to be change agents for society at large.

16. The Quality of Relationships Matters

Institutions and managers often operate as if the only way to stimulate others to act is through establishing a relationship of authority, and then policing their behavior. This seems to presuppose that intimidation and threats of enforcement are the only reliable motivators. However, in some cases, this approach produces the opposite effect: when people feel forced to act or manipulated, they often rebel. In other cases negative reinforcement is simply not as effective as positive reinforcement. Ultimately, the success of a regulation depends on people's willingness to support and comply with it. A pollution prevention worker may be more effective as a facilitator, partner, or trusted resource than as a regulator or enforcer.

PART IV: AN AGENDA FOR FUTURE RESEARCH AND OTHER WORK

With the completion of Phase I of this project, we are closer to understanding the role that cultural barriers and facilitators play in affecting pollution prevention behavior. We have also learned what needs to be done if we are to gain greater insights into cultural barriers and facilitators.

1. Cultural Barriers As an Area of Study

It is clear from the research that has been done thus far that cultural barriers to pollution prevention behavior is not a cohesive area of research that has developed its own specific body of literature. It is a new, emerging area of investigation and concern. In our search of the literature, we have drawn from studies in numerous disciplines and fields that focus on a wide range of human activities. These studies have addressed topics ranging from recycling and seatbelt use to consumer choices. We have attempted to gather together these diverse literatures and read them as addressing some common themes and problems, but it will be important for future work to provide definition and organization to this field and to identify those questions that can be most productively pursued under current conditions.

2. What We Can Still Learn about Values

It also became clear in Phase I of this project, that although we have gained insight into how values are formed in general, we lack methods for predicting value change. It has been argued by some that the very fact of limited resources must ultimately entail a major shift away from the growth-oriented course that our society is on. Others believe this shift is already beginning to occur. But there is still much to be learned about the whole area of values, and about the relationships between social and environmental changes, shifts in social norms, changes in individual value structures, and modifications of behavior. Specifically, much remains to be learned about how environmental values relate to pollution prevention in particular. General

values about environmental concern do not necessarily get expressed in specific action; it is specific values which undergird specific behaviors. We need to be clearer about what the specific values are which contribute to pollution prevention and how those values work in human behavior.

Another consideration which it will be important to address as we gain a greater understanding of values formation is the ethics of modifying the values of others. In our Phase I work we encountered some concern about the role of government in affecting and implementing environmental values. This was expressed both as a concern about the ethics of government modifying environmental values, and as a concern about the ethically acceptable methods of such modification.

3. The Role of Psychology

Psychology is an important discipline of broad relevance, but it has taken less interest in studying environmental behavior than one would expect. Part of the reason for this may be that environmental problems have traditionally been regarded as technical and engineering challenges. Yet pollution prevention ultimately is a matter of human behavior. It is humans who make consumer choices and energy use decisions and who can bring pressure to bear on those who pollute. Even where there are technological solutions to environmental problems, psychological factors still play a role: people must be motivated to adopt them. Psychology has an important role to play in helping us to understand pollution prevention behavior.

It is also clear that we need to know more about what we have to work with before we can launch any program that we expect to be effective. We need to know more about people's pre-existing beliefs, ideas, and attitudes. Everyone has ideas about how something like a furnace works, and these ideas affect how they use that appliance. We also know that people overestimate the energy usage of those appliances of which they are most aware. They are often baffled that they do not see huge savings in their energy bills as a result of turning out the lights more often and turning

on the television less.

People look at the world through conceptual frameworks; they organize information in ways that are consistent with what they already know. If information is presented that doesn't fit an existing framework or preconception, it may be rejected or inaccurately incorporated. Yet very little is currently known about how people perceive pollution prevention. We need a clearer understanding of what people already know and believe about pollution prevention so that we can build on this information in designing effective pollution prevention programs.

4. People as Consumers

We need more information about how people make consumer decisions. One of the areas of individual action that can have the greatest impact is that of capital purchases. An efficient furnace, car, or refrigerator can produce an energy savings that will generally outstrip the savings that result from decreased use. Yet little is known about how pollution prevention considerations influence major investments.

There is a large, fairly inconclusive literature on how demographic factors influence environmental concern and activity. However little has been done specifically on demography and pollution prevention behavior. Since everyone in our diverse society is a pollution actor, it is important to understand the role of various demographic considerations. Such findings would be crucial for designing programs that deal with consumer decisions, energy use, and pollution prevention education.

5. Practical Applications

The primary focus of this project has been on how cultural barriers and facilitators affect individual behavior. However, it is important to recognize that individual behavior occurs in an institutional environment, and that corporate and governmental structures are themselves important pollution prevention actors. We need to look closely at the role of pollution prevention in the context of corporate and governmental institutions. Although institutions are comprised of individual actors, they can have

distinctive behaviors that are different from how any of the individuals who compose them would act in their personal lives. We also need to know more about how institutional structures influence individual behavior.

Finally, a great deal of pollution prevention activity is currently taking place at the state and local level. This activity needs to be studied in an attempt to identify the ingredients that contribute to success and those that contribute to failure.

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PERIODICALS

Jack Arbuthnot
"Environmental Knowledge and Recycling Behavior as a Function of Attitudes and Personality Characteristics"
unpublished
keys: attitudes, information, recycling, psychology

This study hypothesized that recyclers would be less economically oriented; believe less in salvation through technology; be more oriented toward using legislation to solve environmental problems; feel more environmentally efficacious; be more future oriented; perceive the system as more modifiable; feel more personal control; have higher self-esteem; be less superstitious, less conventional, less committed to patriotic symbols; be lower in need for order; and feel more social responsibility. Also, recyclers were expected to be higher in social class and education, younger, and more likely to belong to an environmental group, to have read more books on the environment, and to be more environmentally knowledgeable.

Study indicated that recycling behavior was predictable from education and knowledge about the environment more than by personality and attitudes. On the other hand, environmental knowledge was predictable from personality and attitudes as well as access to information. All personality variables but social responsibility correlated with recycling behavior. Therefore, personality characteristics are predictive of environmental action. The scales do overlap and so the total amount of variance accounted for beyond that explained by education and knowledge was small. Factors to be considered in the effort to increase ecological behavior include raising the information level of the public on the issues and taking personality and

attitudinal predispositions into account when providing information.

Elliot Aronson and Michael O'Leary
"The Relative Effectiveness of Models and Prompts on Energy Conservation: A Field Experiment in a Shower Room"
Journal of Environmental Systems
Vol. 12, No. 3, 1982-83, pp. 219-24
keys: modeling, information, message, sociology

Impersonal measures like information campaigns might not be effective for energy conservation programs because what is often being asked of people is the adoption of an innovation or lifestyle change. Behavioral scientists suspect that in the area of adoption of innovation, people are influenced by direct contact with the behavior of other people through modeling and social diffusion. In an experiment performed at the athletic field house shower at University of California-Santa Cruz, there was an increase in compliance due to modeling and compared with simple posting of an informative request. The compliance increased more when the number of persons modeling behavior was increased from one to two.
Note: Psychological reactance as a behavioral phenomenon (named by Jack W. Brehm, 1966) where people are observed to react in a manner directly opposite to the behavior requested. Authors note, "If reactance operates on some people in response to prompts it could conceivably wipe away whatever energy is saved by the people who comply."

Wallace Bachman and Richard Katzev
"The Effects of Non-Contingent Free Bus Tickets and Personal Commitment on Urban Bus Ridership"
Transportation Research
Vol. 16A, 1982, pp. 103-8
keys: incentives, commitment, behavior, sociology, psychology

All experimental conditions produced higher levels of bus ridership than the control group which received no treatment. The conditions included: provision of route and schedule information; securing commitment from subjects to ride the bus; unlimited supply of free tickets; combination of free tickets and commitment. During follow up, subjects were still riding the bus. This suggests that the interventions employed in this study may have permanently weakened the influence of those factors which had previously kept non-bus riders from riding, such as fears and lack of bus riding skills. The incentive of free tickets and personal commitment procedures were equally effective in increasing ridership. Therefore, in <u>practical</u> terms, it may be more effective to have individuals commit themselves to a behavior than to reward them for doing so.

Albert Bandura and Daniel Cervone
"Self-Evaluative and Self-Efficacy Mechanisms Governing the Motivational Effects of Goal Systems"
Journal of Personality and Social Psychology
Vol. 45, No. 5, 1983, pp. 1017-28
keys: efficacy, psychology

Looks at whether self-evaluative and self-efficacy mechanisms influence the effects of goal systems on motivating performance. Study found when both factors were present, the evaluative and efficacy self-reactive influences predicted the extent to which motivation was enhanced. The higher the self-dissatisfaction with a sub-standard performance and the stronger the perceived self-efficacy for goal attainment, the greater the following intensification of effort. When one of the comparative factors is missing, the relation of self-reactive influences to performance motivation depends on the nature of the partial information provided or the information that performers construct for themselves.

Karl E. Bauman, John LaPrelle, Brown, Koch, Padgett
"The Influence of Three Mass Media Campaigns on Variables Related to Adolescent Cigarette Smoking: Results of a Field Experiment"
American Journal of Public Health
Vol. 81, No. 5, 1991, pp. 597-604
keys: smoking, message, behavior, sociology

Media campaigns did influence attitude ("subjective expected utility") toward smoking and friend approval, variables that are related to the onset of smoking. Campaign making use of radio was as effective for these variables as any of the campaigns using more expensive media, e.g., TV. But the study detected no effect for actually reducing the onset of smoking, and any potential effect for smoking itself remains also to be demonstrated. There is the contention that to be effective, mass media campaigns require implementation with other variables such as school-based curricula support. This study was designed to determine whether media are influential in and or themselves. The peer involvement component was also not effective. (Article lists characteristics media experts consider necessary for effective campaigns, such as content based on behavioral science theory, etc., p. 602)

Lawrence J. Becker, Clive Seligman, Russell H. Fazio, John McConnon Darley
"Relating Attitudes to Residential Energy Use"
Environment and Behavior
Vol. 13, No. 5, September 1981, pp. 590-609
keys: attitude, self-interest, framing, sociology, psychology

Surveys found that factors which predicted energy

consumption were comfort and health (specific energy-related attitudes). Homeowners' beliefs in whether the energy crisis was legitimate did not significantly correlate with energy consumption. Public skepticism about the reality of energy problems is often viewed as the major barrier to conservation with the implication that people need to be convinced the energy crisis is real. This is not the case in this study and that of Seligman, et al., 1977-78. Conservation campaigns, therefore, should include theme that saving energy is not equated with sacrificing comfort. Study also found consistency in attitudinal factors over time.

Linda Bennett
"Behavior Study on Recycling Participation"
Biocycle
November 1970, p. 37
keys: recycling, attitude, behavior, sociology

Feelings have a greater impact on an individual's willingness to recycle than convenience of program. Household size correlated negatively; knowledge of program correlated positively. Though initial participation in program depended on feelings, continued participation depended on the quality of service of the program.

J. Stanley Black, Paul C. Stern, and Julie T. Elworth
"Personal and Contextual Influence on Household Energy Adaptations"
Journal of Applied Psychology
Vol. 70, No. 1, 1985, pp. 3-21
keys: energy efficiency, attitudes, beliefs, norms, responsibility, psychology

Study which was a path analysis based on a causal model which assumes that contextual variables (e.g., demographic, economic) affect behavior indirectly through personal variables (attitudes, beliefs). Results suggested that although behaviors that are unconstrained (i.e., don't take special circumstances or ability, such as setting a temperature) are influenced by norms, personal variables have much less influence on more constrained actions (e.g., major insulation installation, replacing a furnace). Capital investments are constrained by many factors including funds; low-cost investments are more readily undertaken in response to norms because they are less constrained by factors out of the consumer's control. Thus, personal norms influence behavior, but only within limits set by the context of consumer choice. The effect of high and rising fuel prices was stronger in producing economic sacrifice than in producing energy savings. Home ownership seems to be a central factor influencing major energy investments, suggesting that investments have been made on the basis of (perceived) self-interest. Generalized concern

with the national energy situation does not influence behavior directly but exerts an indirect influence by affecting personal norms. This concern more strongly affects the sense of obligation to cut back than the sense of obligation to improve efficiency.

T. Jean Blocker and Douglas Lee Eckberg
"Environmental Issues as Women's Issues: General Concerns and Local Hazards"
Social Science Quarterly
Vol. 70, No. 3, September 1989
keys: gender, environments

This research analyzes gender differences in concern toward general and local environmental issues. Findings from a local survey indicate that women are no more concerned than are men about *general* environmental issues, but are significantly more concerned about the *local* environmental issues. Those participating in the labor force are more environmentally concerned than are nonparticipants. While mothers of small children in this sample show less concern over the effects on the economy of implementing environmental controls, fathers of small children are more concerned about these effects.

Allan Brandt
"The Cigarette Risk and American Culture"
Risk
Vol. 119, No. 4, 1990, pp. 155-76
keys: smoking, risk assessment, attitude, image, perception, public policy, anthropology

This article traces history of the behavior of smoking and the establishment of its health risks. Smokers had been able to justify behavior as private--they could choose what they wanted to do as long as it didn't harm any one else. This attitude was undermined by studies which demonstrated the secondary effects of smoking. The image of the smoker has been redefined from that of strong and attractive to that of weak and irrational. Behavior is shaped by cultural, psychological, biological processes: behaviors such as smoking are sociocultural phenomena, not merely individual, or necessarily rational.

Jack W. Brehm, Lloyd K. Stires, John Sensenig, and Janet Shaban
"The Attractiveness of an Eliminated Choice Alternative"
Journal of Experimental Social Psychology
Vol. 2, 1966, pp. 301-13
keys: behavior

Brehm's theory implies that the elimination of a choice alternative will tend to increase the attractiveness of that alternative to the person who is about to make the choice. Two experiments, in which college students rated the

attractiveness of four recordings of music in order to be able to choose one for themselves, found that the third most attractive record increased in attractiveness when it became unavailable as one of the choice alternative. The second experiment included a condition in which some subjects were given no prior freedom to choose which record they would receive. Its results indicated that the tendency to see the eliminated record as more attractive occurred only when subjects had prior freedom to choose which record they would take.

Robert Bullard and Beverly Hendrix Wright
"Environmentalism and the Politics of Equity:
Emergent Trends in the Black Community"
Mid-American Review of Sociology
Vol. 12, No. 2, 1987, pp. 21-38
keys: ethnicity, message, risk assessment, belief, activism, sociology

Black communmities are just beginning to integrate environmental issues into traditional civil rights agendas. The promise of jobs is attractive to economically depressed area; but there is a need for assessment of health and environmental risks. The black community needs to use its institutions--churches, civil rights and political organizations, etc.--to address environmental problems.

Robert D. Bullard and Beverly Hendrix Wright
"The Politics of Pollution: Implications for the
Black Community"
Phylon
Vol. 47, No. 1, 1986, pp. 71-78
keys: ethnicity, income activism, message

Blacks, low-income groups, and working class persons subjected to a disproportionately larger amount of pollution within workplaces and neighborhoods. These communities do not have a history of organizing to challenge public policy decisions. More recently, the base of environmental support has been broadened with the inclusion of issues that relate to these groups.

Shawn M. Burn
"Social Psychology and the Stimulation of Recycling
Behaviors: The Block Leader Approach"
Journal of Applied Social Psychology
Vol. 21, No. 8, 1991, pp. 611-29
keys: recycling, incentives, public commitment, norms, role models, framing, sociology, psychology

Data indicate that both the block leader approach and leaving a persuasive communication and recycling bags at the door of households are successful in increasing recycling. It is not clear why the block leader approach is successful. This could be for several reasons: modeling, providing

social incentive through social recognition, or likelihood of block leader securing verbal commitment.

Shawn M. Burn and Stuart Oskamp
"Increasing Community Recycling with Persuasive Communication and Public Commitment"
Journal of Applied Social Psychology
Vol. 16, No. 1, 1986, pp. 29-41
keys: marketing, recycling, information, commitment, sociology, psychology
Article recaps research in persuasive communication area:

* information can't deviate too far from existing beliefs
* inclusion of information from reference groups relevant to the individual
* issue involvement increases motivation to process message
* potential noxious consequences emphasized
* personalized communication
* credibility of source
* degree of specificity of recommended action

Study also looks at effectiveness of public commitment. Attitudes stated publicly are relatively stable; public expression increases performance of behaviors consistent with them. Both techniques (i.e., utilization of persuasive communication techniques and public commitment) increased recycling behavior. Authors note that communication *was* delivered face to face (i.e., involved a social interaction).

Frederick H. Buttel
"New Directions in Environmental Sociology"
Annual Review of Sociology
Vol. 13, 1987, pp. 465-88
keys: sociology, behavior, attitudes, values, risk, ecology, political ideology

Article discusses the following five areas of environmental sociological scholarship: 1)"New Human Ecology" argues that basic patterns of social organization are shaped by the imperative of human societies to derive their basic survival needs from the biosphere. This departs from classical human ecology in at least one distinct argument: which is that society does not work in equilibrium with the environment, but rather in continued resource depletion and degradation. An anthropomorphism underlies the "human exceptionalism paradigm," to be distinguished from the "new environmental paradigm." New human ecology argues humans must shed this anthropomorphism and reject the notion that because of their capacity for culture, technology, etc., humans are exempt from the ecological laws that govern other species. 2) Environmental Attitudes, Values and Behaviors which have fluxed over the years. Age,

education, and residence were found to be lesser factors than political ideology in measures of environmental concern. The differences between attitudes and opinions as noted by Heberlein (1981) are stressed here. The very general measures of environmental concern predominant in the sociological literature tend to tap mere opinions rather than attitudes. These opinions are largely unembedded in cognitive structure and so would not be expected to affect behavior significantly. Environmental attitudes are found to show an internal cognitive consistency as well as being related to the number of accurate beliefs held about attitude objects. Heberlein (1981) suggests that environmental attitudes among the American public have become more differentiated since the early 1970's, and that these more specific attitudes tend to be better predictors of environmental behaviors than general environmental opinions are (Heberlein and Black, 1981). Environmental protection attitudes "reflect social-psychological processes involving the activation of moral norms against hurting people" (Stern et al., 1986). Monetary incentives are found to be less important than non-monetary. 3) The Environment Movement. 4) Technological Risk and Risk Assesment. 5) The Political Economy of the Environment and Environmental Politics.

Frederick H. Buttel and Donald E. Johnson
"Dimensions of Environmental Concern"
Journal of Environmental Concern
Vol. 9, 1977, pp. 49-64
keys: attitude, psychology, social class, political affiliation

Attitudinal items factor into more than one distinct dimension. "Environmental concern" and "environmental reform" are ambiguous concepts because the "nature of social change sought under this rubric is not explicit." The assumption of the uni-dimensionality of environmental concern is unwarranted: a sample of community elites found environmental issues to be at least bi-dimensional. Article pursues dichotomy as that of two broad dimensions: whether the scope of environmental reform is basically ameliorative (environmental concerns more cosmetic or *post hoc*; seeks solutions within present institutional context) or redirective (toward new social order, i.e., challenging the legitimacy of industry which pollutes excessively). Authors hypothesize that indicators of "objective interests" in environmental reform will be more closely related to redirective concern than ameliorative. Study uses three independent variables as indicators of these objective interests: ownership of or employment by commercial or industrial enterprise; socioeconomic status of community of residence; attitudinal scale of support for economic growth. There is little correlation between "objective interests"

and the ameliorative dimension of environmental attitudes. Persons who own or are employed by commercial enterprises, who favor continued and expanded economic growth, and who live in low socioeconomic status communities are unlikely to support environmental initiatives which threaten industrial polluters. Political liberalism is more strongly associated with ameliorative concern than redirective environmental concern; a slightly greater association of higher amount of education with redirective concern than with amelioration.

Robert B. Cialdini, Raymond R. Reno, Carl A. Kallgren
"A Focus Theory of Normative Conduct: Recycling the Concept of Norms to Reduce Littering in Public Places"
Journal of Personality and Social Psychology
Vol. 58, No. 6, 1990, pp. 1015-26
keys: littering, norms, psychology

Article makes the distinction between descriptive (is) and injunctive (ought) norms. Researchers have repeatedly found that the perception of what most others are doing influences subjects to behave similarly, even when behaviors are morally neutral. To predict the likelihood of norm-consistent action requires specification of type of norm and taking into account conditions that would incline to focus attention on or away from the norm. Effectiveness of injunctive social norms has the clearest support in this study. Enduring cultural and dispositional conditions also influence one's normative focus. Norms function at more than one level: cultural/societal, situational, and individual.

Constance Ewing Cook
"Participating in Public Interest Groups: Membership Motivations"
American Politics Quarterly
Vol. 12, No. 4, October 1984, pp. 409-30
keys: behavior, incentives, efficacy, activism, sociology

People join special interest groups to gain something, although what they anticipate gaining is often noneconomic and intangible: solidary incentives (being with others who share interests, access to specialized information) and purposive incentives (policy commitment, feeling of civic duty and a sense of political efficacy, which is the strongest).

Stuart W. Cook and Joy L. Berrenberg
"Approaches to Encouraging Conservation Behavior: A Review and Conceptual Framework"
Journal of Social Issues
Vol. 37, No. 2, 1981, pp. 73-107
keys: message, attitude, behavior, incentives, group commitment, models, convenience

This article looks at various ways of conceptualizing

conservation approaches primarily as intervention techniques. Authors organize these intervention techniques under the following categories: persuasion and communication; evoking attitude-consistent behavior; material incentives and disincentives; social incentives and disincentives; modeling of behavior; facilitating the implementation of behavior change; and providing information on the effectiveness of change. Authors note that the impact of persuasive communications may be reduced if the recommended changes deviate too afar from the individual's existing beliefs and practices.

Mark Costanzo, Dane Archer, Elliot Aronson, and Thomas Pettigrew
"Energy Conservation Behavior: The Difficult Path from Information to Action"
American Psychologist
Vol. 41, No. 5, 1986, pp. 521-28
keys: conservation, belief, attitude, behavior, social networks, modeling, psychology

The two models used to influence conservation behavior, the attitude-change model and the rational-economic model, underestimate the complexity of human behavior. Research indicates the lack of a direct relationship between attitudes and energy conservation behavior. Four "intrapsychic" events must occur before a proconservation information campaign will result in adoption of an energy-saving device: perception, favorable evaluation, understanding, remembering. There are also four positional factors which best predict adoption of energy-saving device: home ownership, socioeconomic status, ownership of home technologies, presence of household member able to perform repairs. Innovation diffusion occurs through existing social networks and involves two influence processes: information communicated via interpersonal contact and the modeling of effective behavior. Information received from friends and acquaintances is vivid and personal, perceived as credible.

John M. Darley
"Energy Conservation Techniques as Innovations, and Their Diffusion"
Energy and Buildings
Vol. 1, 1977-78, pp. 339-43
keys: feedback, diffusion of innovation, efficacy, social networks

Study traces the adoption of set-back thermostat in neighborhood. Feedback was important. Study found that adoption is due to psychological factors or perceived characteristics of the innovation, such as how difficult it is to operate, rather than economic ones. Perception of efficacy was important: people needed to believe there was a specific, usable innovation available that would address the

problem. Diffusion proceeds along sociometric (existing communication networks) rather than spatial networks. Adoption decisions are blocked by barriers such as low certainty that the innovation will produce savings together with doubts about skills to install or decide on innovation. Authors suggest government provide "change agent" who would go in and test house and make suggestions.

John M. Darley and James R. Beniger
"Diffusion of Energy-Conserving Innovations"
Journal of Social Issues
Vol. 37, No. 2, 1991, pp. 150-71
keys: information, social networks, perception, behavior, psychology, anthropology

The decision to adopt an energy-conserving product or process is an instance of the decision to adopt an innovation, an innovation evaluated on the basis of certain psychological dimensions (such as its relative advantage, its value compatibility with needs of consumer, its complexity, triability, etc.). The perceived characteristics of an innovation rather than its "objective" status influence the adoption decision. Information that determines people's perceptions of innovations is more likely to be transmitted via social networks than by mass media. So, arguing from the social-science research on diffusion processes, the economic strategy of encouraging energy conservation (such as that followed by the US Government) is not likely to be effective.

Raymond De Young
"Recycling as Appropriate Behavior: A Review of Survey Data from Selected Recycling Education Programs in Michigan"
Resources, Conservation, and Recycling
Vol. 3, 1990, pp. 253-66.
keys: recycling, behavior, education

Compares data from surveys conducted by six separate recycling education programs funded under the Clean Michigan Fund. A strong pro-recycling attitude exists among the populations sampled with a significant percentage of respondents planning to increase their level of recycling in the future. To aid this increase in participation, education efforts should focus on helping people become more familiar with the details of how to recycle. Efforts to promote waste reduction and recycling behavior should focus on non-monetary motives.

Raymond De Young
"Encouraging Environmentally Appropriate Behavior: The Role of Intrinsic Motivation"
Journal of Environmental Systems
Vol. 15, No. 4, 1985-86 pp. 281-92
keys: intrinsic motivation, efficacy, psychology

Findings support notion of strong relationship between intrinsic motivation and everyday conservation behavior. An intrinsic motivation is doing something for its own sake or because it "feels good," without the promise of tangible returns. Our understanding of why people conserve may be improved by investigating intrinsic motivation and personal satisfactions derived from conservation activities (e.g., satisfaction of frugal life, sense that one's actions matter, sense of coherence between one's efforts and larger world.)

Raymond De Young
"Exploring the Difference Between Recyclers and Non-Recyclers: the Role of Information"
Journal of Environmental Systems
Vol. 18, No. 4, 1988-89, pp. 341-51
keys: recycling, attitude, motivation, psychology, sociology

De Young uses R.H. Wiegel's definition of attitude which is: "...attitudes represent relatively enduring sets of beliefs and feelings about an object which predisposes the attitude-holder to act in a particular way toward that object." Recyclers and nonrecyclers did not have significantly different scores on a pro-recycling attitude scale. The two groups did not differ in their ratings of extrinsic motivation and trivialness and frugality. The nonrecyclers did perceive recycling behavior to be more difficult. This suggests that the issue may not be *why* one ought to recycle, but *how* to carry out the behavior. Surprisingly enough, there were respondents who recycle but who have a less positive attitude about the activity. A behavior-attitude model might predict that this group's attitude would become more positive over time, though it doesn't explain present behavior. This may be due to social pressure. As more households recycle, it becomes embarrassing not to recycle.

Raymond De Young
"Some Psychological Aspects of Recycling: The Structure of Conservation Satisfactions"
Environment and Behavior
Vol. 18, No. 4, July 1986, pp. 435-49
keys: recycling, attitude, value, psychology, sociology

A great deal of research has been done on the use of extrinsic incentives in recycling programs. Extrinsic incentives have their drawbacks: they don't promote enduring behavior changes and may cost more to produce than actual results save. Author proposes looking at the goals and rewards that arise out of active participation in an ongoing activity. Study found four satisfactions: frugality, careful use of resources; self-sufficiency and self-reliance; the idea that humans are active, knowledge-generating creatures; and luxury, being a member of an

affluent society and participating in the good life. The satisfactions were generally uncorrelated with the other satisfaction scales. So, it is not contradictory to derive satisfaction from both frugality and luxury. Thus, environmentally appropriate behavior may be made to appeal to a broad cross-section of Americans. "The idea of getting by with less can easily be characterized as a form of sacrifice. Yet the study reported here suggests that conservation can also be perceived as contributing to one's sense of satisfaction."

Raymond De Young
"Promoting Conservation Behavior in Shared Spaces: The Role of Energy Monitors"
Journal of Environmental Systems
Vol. 19, No. 3, 1989-90, pp. 265-73
keys: modeling, norms, diffusion, sociology, psychology

Study determined result when a group of building users were enlisted to be models of energy conservation behavior. The state of the place where an individual works helps to define the norms of behavior in that place. Individuals acted as energy monitors to spread information and define norms. Approach was participatory, including direct involvement on part of users. Participation allows individuals to interact directly with the environment, enhances their understanding of the environment and their role in it, and increases their feelings of responsibility about the functioning of that environment.

Raymond De Young
"Some Psychological Aspects of Living Lightly: Desired Lifestyle Patterns and Conservation Behavior"
Journal of Environmental Systems
Vol. 20, No. 3, 1990-91, pp. 215-27

This study looks at whether a conservation-oriented lifestyle might have its own intrinsic satisfactions. Study took form of a mail-back survey. The relationship between lifestyles and environmentally responsible behavior is gaining attention. The core of this lifestyle is frugality which is often portrayed as an austere one of sacrifice, an onerous undertaking. But there is also an historical basis for regarding the austere and simple life as one rich with an inner sense of well being. So an environmentally responsible lifestyle might provide for a sense of personal satisfaction *per se*. Three satisfaction scales emerged from the survey: frugality (defined as prudent use of resources); the opportunity to participate or become involved; and deriving satisfaction from the acquisition of luxuries. The satisfaction from luxuries scale interestingly enough had a low correlation with each of the other satisfaction scales which would seem to indicate that the satisfaction derived

from luxuries is not incompatible with the satisfaction gained from frugality or participation. The data reported in this study offer the perspective that rather than conservation being equated with sacrifice, it was associated with forms of intrinsic satisfaction and a reduced consumption lifestyle. So, making the distinction between curtailment and efficient energy use might not prove to be the most productive approach to the promotion of conservation behavior.

Raymond De Young
"Changing Behavior and Making It Stick: The Conceptualization and Management of Conservation Behavior"
IN PRESS
keys: information, incentives, group influence, experience, coercion, psychology

De Young categorizes behavior change techniques as of three types:

(1) informational techniques - help people understand the nature of the problem and what to do to remedy it

(2) positive motivational techniques - include extrinsic motivation and intrinsic when an individual is helped to discover a behavior that is worth doing in its own right. Intervention strategies try to draw attention to the behavior.

(3) coercive techniques - physical or perceptual constraints of choice - in general, environmental psychology argues against use of punishment. It should be noted, however, that monetary and social disincentives can be considered coercive in nature, as might the employment of fear messages.

Article distinguishes source of change within these techniques as coming from the environment/others or as having an internal source (discovery, direct experience, commitment, intrinsic satisfactions, sense of duty, sense of dread).

De Young wants to evaluate methods on basis of effectiveness, cost-benefit, reliability, speed of change, and particularism, generality, and durability.

More research is needed on person-initiated categories of behavior change techniques; commitment is one of the only techniques in these categories to have been adequately investigated. The dominant paradigm is to stress the environment and others as the source of conservation behavior change and to minimize role of individual. Yet no technique is optimal. One which causes rapid behavior change may not result in durable change. The promotion of conservation behavior should draw on techniques utilizing both person-initiated and other-initiated behavior change approaches.

Raymond De Young and Stephen Kaplan

"Conservation Behavior and the Structure of Satisfactions"
Journal of Environmental Systems
Vol. 15, No. 3, 1985-86
keys: incentives, behavior, psychology

There are numerous everyday behaviors that people do because they like doing them: they are sources of satisfaction. De Young wants to look at whether conservation is dependent on an austere outlook (e.g., value of frugality) or whether it might provide payoffs of a more ordinary, potentially more widely shared kind. Study found that people who conserve are not different from other people; conservation does not depend on having a special outlook.

Study found three dominant satisfaction themes: a) conservation ethic - reflected concern for conservation or resources and a sense that individuals are responsible for proper use of the earth's resources; b) money - sense of satisfaction resulting from saving money; sharply distinct from other types of satisfactions resulting from saving energy; c) comfort and convenience - includes the desire to live a comfortable existence and a concern for not wasting one's time.

The themes, taken as a whole, indicate participants were inclined to interpret their behavior in a larger context. Part of this larger context may involve the ability to justify one's behavior. People seem to seek an interpretation of their behavior that makes sense to them and that they believe makes sense to others. Being able to identify a reasonable justification may be a significant part of the ultimate decision to go ahead with a conservation activity.

Raymond De Young and Stephen Kaplan
"On Averting the Tragedy of the Commons"
Environmental Management
Vol. 12, No. 3, 1988, pp. 273-83
keys: commons, sociology, policy

The commons dilemma is the case where individual rational behavior (acting without restraint to maximize short-term gain) causes great long-range harm to self and/or others (defined by Platt, 1973). The article explores a framework within which solutions to the tragedy of the commons might be found which are compatible with human nature and with available natural resources. One of the most salient human concerns emerging is the need to maintain a degree of choice.

Authors point out that coercion has an implementational weakness: Those whose freedom has been constrained may show an increased desire for a forbidden alternative or decreased desire for what they feel forced to do. Centralized planning reduces the chance of people messing things up, but also can

eliminate a degree of diversity essential to effective resource management. Muddling consists in seeking the advice of those most affected by the decision, checking out every step in advance for acceptability, and never venturing far from the result of past changes. This demands not an optimal solution but an adequate and acceptable one and preserves the ability to pursue a variety of potential solutions at one time. Authors propose what they call "adaptive muddling" which has three facets: exploration, stability, and distributed leadership.

Raymond De Young, Andrew Duncan, Jeffrey Frank, Nancy Gill, Shereen Rothman, John Shenot, Andrea Shotkin, and Miriam Zweizig
"Promoting Source Reduction Behavior: The Role of Motivational Information"
DRAFT
keys: information, conservation, motivation, education sociology

This study addresses behavioral change using information based on both economic and environmental rationales. Source reduction represents a departure from society's way of managing materials: more efficient packaging and reduced consumption are not commonplace in Western government, industry, individual thought. The present study looked at previous approaches based on non-economic motivational strategies such as altruism, intrinsic satisfaction, and social commitment and based its informational appeal on these findings. Pamphlets were used which gave not only reasons for performing the desired behavior but specific procedural information about how to perform behavior. Behavior changes were self-reported. Results showed individuals are concerned about both the environment and their economic interests. Participants were more likely to practice home-based source reduction activities such as reuse of aluminum foil rather than consumer-based source reduction activities such as buying goods with less packaging.

William D. Diamond and Ben Z. Loewy
"Effects of Probabilistic Rewards on Recycling Attitudes and Behavior"
Journal of Applied Social Psychology
Vol. 21, No. 19, 1991, pp. 1590-607
keys: recycling, attitude, behavior, rewards, psychology

Article discusses results of two studies which compared the attitudinal and behavioral effects of certain rewards and lotteries. One study combined two elements which should be associated with attitude change: writing down arguments and the use of probabilistic rewards. Probabilistic rewards did, on the average, lead to more attitude change than

certain payments. Subjects who won the lottery had very polarized posttest attitudes in the direction of their written reasons. The attitude change produced by writing arguments was augmented by winning a lottery. The second study compared the effects of several types of reward as agents of both attitude and behavior change (certain, probabilistic, and group rewards). No significant correlation between either pretest attitudes, posttest attitudes, or attitude change and participation in the recycling program was found. Interpret results of second study in terms of operant conditioning: all reward conditions led to more recycling. The possibility of an immediate large payoff from an instant lottery winner was greatest inducement. Individual rewards led to greater recycling than group rewards. From these studies, it appears that to maximize attitude change, rewards should not be certain and there should be as many prizes as possible to maximize number of winners.

Thomas Dietz, Paul C. Stern, and Robert W. Rycroft
"Definitions of Conflict and the Legitimation of Resources: The Case of Environmental Risk"
Sociological Forum
Vol. 4, No. 1, 1989, pp. 47-70
keys: value, framing, risk assessment, belief, economics, politics

Looking at the social constructions of conflict can provide insight into the dynamics of environmental policy. Delineating the nature of the conflict can be a means of legitimating the mobilization of resources. Conflict has been defined in at least four ways:

1) differential knowledge--the public is uninformed concerning risks; requires expert understanding;
2) vested interest--risks are distributed unequally so there will be winners and losers from any policy decision;
3) value differences--underlying values are the only means of making choices;
4) mistrust of expert knowledge--people have come to distrust expert knowledge as interest serving.

For different kinds of conflicts, different resources are considered legitimate: in economic conflicts, material resources; in political conflicts, public support; in scientific or technical conflicts, expertise. So, the choice to consider a social problem as one type of conflict or another will have implications for which resources get legitimized. An example is slavery in the US, where the abolitionist movement was successful in redefining what had been seen by many as an economic issue into a political one. Definitional struggles are often important factors in the dynamics of social change. Recent scientific studies have shown that human activities might have consequences that

Western industrialized societies have traditionally managed through a political system (rather than economic one), implying that the conflict is now a political one. In this kind of social climate, it will then be in the interest of opponents of the environmental movement to define environmental issues as scientific or technical rather than as political to prevent the legitimization of public support as a resource.

Raymond G. Disposito
"Interrelationships Among Measures of Environmental Activity, Emotionality, and Knowledge"
Educational and Psychological Measurement
Vol. 37, 1977, pp. 451-59.
keys: education, behavior, concern

Study rendered results contrary to Maloney, Ward, and Braucht's who claimed there was little relation between knowledge and action concerning the environment. This study found that knowledge, and not emotion, does affect actions. Implications for education point to continued and increased awareness of environmental facts.

Richard D. Dixon, Roger C. Lowery, Diane E. Levy and Kenneth F. Ferraro
"Self-Interest and Public Opinion Toward Smoking Policies: A Replication and Extension"
Public Opinion Quarterly
Vol. 55, 1991, pp. 241-54.
keys: smoking, self-interest, sociology

This study replicated the findings of study by Green and Gerken, 1989, that self-interest deriving from smoking status and "degree of bother" associated with smoking have significant effects on opinions about public smoking restrictions and smoking taxes. Other studies revealed that directly affected individuals were not more or less likely than others to favor or oppose jobs programs, government health insurance, aid to education, affirmative action. This difference is explained by finding that self-interest has a greater influence on policy attitudes when the costs and benefits of a proposal are unambiguous and salient in minds of respondents. This study added some independent variables and found that another measure of self-interest, profiting from tobacco, was the strongest predictor of the smoking attitudes studied.

Riley E. Dunlap and Kent D. Van Liere
"Comments and Rejoinders" (to Heberlein on "Land Ethic")
Journal of Social Issues
Vol. 33, No. 3, 1977, pp. 200-7
keys: values, attitudes, beliefs, sociology

Recent societal trends call into question Heberlein's suggestion that an environmental ethic is being realized in

our society. As it became apparent that the achievement of environmental quality entailed many costs (from economic to restrictions on individual freedom) opposition to environmental reforms escalated and public support for reforms declined. There have been some normative and legal changes which probably stem more from traditional moral precepts (such as respect for welfare of fellow humans) than from the emergence of an environmental ethic. Conclusion: traditional moral norms governing interpersonal behavior appear also to influence environmental behaviors when the latter are seen as having consequences for humans.

Riley E. Dunlap and Kent D. Van Liere
"The 'New Environmental Paradigm'"
Journal of Environmental Education
Vol. 9, 1978, pp. 10-19
keys: belief, framing, values, psychology

Transition to a steady-state society to cope with increasing scarcity and limited growth will be aided by acceptance of the New Environmental Paradigm, i.e., limits to growth, the importance of preserving balance of nature, etc. Study finds a rapid growth in the acceptance of NEP in state of Washington from the Dominant Social Paradigm which had been accepted.

Peter Ester and Richard A. Winett
"Toward More Effective Antecedent Strategies for Environmental Programs"
Journal of Environmental Systems
Vol. 11, No. 3, 1981-82 pp. 201-21
keys: marketing, framing, information, role models, social networks, behavior, sociology, communication

Article reviews the literature to evaluate antecedent strategies (interventions used as stimuli before a behavior to influence the behavior, such as information and prompts) and consequence strategies (such as feedback and use of rewards on conservation behaviors including litter control, recycling, transportation, etc.). When attention is given to factors such as specificity, salience, intrusiveness, and convenience, antecedent strategies can have effect, though still less of one than consequence strategies. The effects of antecedent strategies are important because they are less expensive to implement. Many of the antecedent strategies studied were poorly designed ones, such as leaflets that did not make use of the basic tenets of communications research. Authors recommend looking at more effective antecedent strategies such as behavioral modeling and personal contact approaches. Authors note antecedent approaches have been and are logical types of governmental interventions.

Some points of communications theory which are of importance to behavioral environmental research: what is the pre-intervention need of target group? What is the degree

of homogeneity/heterogeneity of target group (indicates whether messages need to be segmented)? How should the communication be designed? How does the target group perceive the communication? What media is best to convey message?

Kenneth F. Ferraro and Grier Jewell-Patton
"Filled With the 'Holy Smoke': Religion and Tobacco in Carolina"
Review of Religious Research
Vol. 30, No. 1, September 1988, pp. 59-72
keys: smoking, belief, attitude, sociology

In addition to smoking status, how bothered people are by sidestream smoke and their propensity to characterize smoking as deviant are the most important factors in predicting support for the legal control of smoking in southern, tobacco-growing states.

Kenneth F. Ferraro
"Health Beliefs and Proscriptions on Public Smoking"
Sociological Inquiry
Vol. 60, No. 3, August 1991, pp. 244-63
keys: smoking, knowledge, risk assessment, psychology

Environmental tobacco smoke effects do not directly affect support for legal controls; rather these are indirect. Interest in constraining public smoking may not be purely concern for clean air, but seen as one more way to delegitimize the smoking lifestyle. The most substantial predictor of support for legal controls on public smoking is the deviant characterization of smoking, a finding which emphasizes the role images play in shaping policy preferences.

Gerald T. Gardner, Adrian R. Tiemann, Leroy C. Gould, Donald R. DeLuca, Leonard W. Doob, Jan A. J. Stolwijk
"Risk and Benefit Perceptions, Acceptability Judgments, and Self-Reported Actions Toward Nuclear Power"
The Journal of Social Psychology
Vol. 116, 1982, pp. 179-97
keys: risk perception, belief, activism, nuclear power, psychology

The results of a questionnaire administered to 367 respondents from five US communities indicated that degree of self-reported action was systematically correlated with the rated "acceptability," risks, benefits, and qualitative characteristics of nuclear power. Another factor that correlated with personal action was confidence in risk-management institutions and organizations.

E. Scott Geller
"Applied Behavior Analysis and Social Marketing: An Integration for Environmental Preservation"

Journal of Social Issues
Vol. 45, No. 1, 1989, pp. 17-36
keys: marketing, framing, behavior, attitude, psychology

Article presents an integrated model of applied behavior analysis and social marketing as an approach to intervention for environmental protection. Environmental behavior analysts maintain it is most cost effective to apply intervention strategies directly to environmentally relevant behaviors, instead of attempting to modify attitudes and values first in hopes of subsequently influencing behavior. (Author actually advocates both approaches: direct attack on behaviors and focus on attitude change.) Behavior analysis interventions are based on the ABC model (antecedent-behavior-consequence). Antecedent strategies include awareness and education sessions (groups need to be small; should include interactive demonstrations and discussions); verbal and written messages (behavior is convenient, message delivery in close proximity to opportunity to perform); modeling and demonstrations (show appropriate behavior, can be done through live demonstration or video); commitment and goal setting; engineering and design strategies (design of environment or machinery such as repositioning a trash receptacle). According to behavior analysis theory, positive attitudes associated with an effective behavior-change technique maximize the possibility for the desired behavior to become a norm. Positive attitudes are more likely to follow incentive/reward techniques, since a positive reinforcement approach is generally perceived as "voluntary." Behavior analysts usually design interventions according to the ABC model (sometimes called "behavioral engineering") which blends stimulus control and contingency management. Antecedent strategies include: awareness and education sessions, verbal and written messages, modeling, commitment procedures, design strategies. This article discusses the integration of the behavior analyst model with the social marketing model (social marketing focuses on promotion of socially beneficial ideas and behaviors rather than material products). Within social marketing, the article discusses market segmentation, place, price, product, promotion.

Harold G. Grasmick, Robert J. Bursik, Jr., and Karyl A. Kinsey
"Shame and Embarrassment as Deterrents to Noncompliance with the Law"
Environment and Behavior
Vol. 23, No. 2, March 1991, pp. 233-51
keys: littering, behavior, sociology

Study uses theories in criminology which suggest that shame, a self-imposed punishment, and embarrassment, a socially imposed punishment, function like threats of state-imposed legal sanctions to reduce expected utility of

illegal behavior. Significant others in the actor's social environment and the actor's own conscience can play a role similar to that of the state. The cost of noncompliance is subjective. Long-term consequences can be loss of valued relationships and restriction in opportunities to achieve other valued goals. Study shows those in study were less likely to litter after an antilittering campaign based on moral appeals, and they scored higher on threats of shame and embarrassment.

Donald Philip Green and Ann Elizabeth Gerken
"Self-Interest and Public Opinion Toward Smoking Restrictions and Cigarette Taxes"
Public Opinion Quarterly
Vol. 53, Spring 1989, pp. 1-16
keys: smoking, self-interest, anthropology

Study finds, in contrast to others, that self-interest plays a role in shaping attitudes toward smoking restrictions and cigarette taxes.

Graeme Halford
"Human Decision-making about Environmental Change"
from *Global Change: The Human Dimensions*,
Harold Brookfield and Loene Doube (eds.)
Research School of Pacific Studies,
The Australian National University, 1990
keys: conceptual

An analysis of the nature of natural decision-making processes and an assessment of their impact on our chances of making effective responses to global change. A model is put forward in which information is necessary for understanding the problem, which in turn affects attitudes, which lead to actions, which are maintained by rewards.

Charles C. Harris, Jr., Tracy A. Miller, and Kerry Reese
"Possible Influences on Donation Behavior: The Case of Idaho's Nongame Wildlife and Endangered Species Tax Checkoff Fund"
Society and Natural Resources
Vol. 5, 1992, pp. 53-66
keys: attitude, experience, knowledge, psychology

The research examines the role of possible determinants of donating behavior: attitude, past behavior, and knowledge; as well as other situational factors such as age, income, sources of information. Authors review conceptual models in attitude-behavior research. In the Fishbein-Ajzen (1975) model, a behavioral intent is a precursor to the actual behavior. In the Bentlar and Speckart (1979) model, attitude can influence behavior directly. Hughes (1984) added past behavior as a behavioral determinant that can directly affect the behavior as well. Study found that knowing a person's attitude toward the program as well as

knowing about a person's past behavior, as well as situational factors (knowledge about the program, in particular), can help predict behavior. Although attitude and past behavior directly influence behavior, they can also have indirect effects on behavioral intent. The authors refer to Hughes' (1984) study which found that increased experience with a behavior is accompanied by a decline in the significance of attitude as a behavioral determinant.

Jane W. Hass, Gerrold S. Bagley, and Ronald W. Rogers
"Coping with the Energy Crisis: Effects of Fear Appeals upon Attitudes Toward Energy Consumption"
Journal of Applied Psychology
Vol 60, no. 6, 1975, pp. 754-56
keys: framing, perception, belief, psychology

Investigated the persuasive effect of two variables that considered fear appeals: the magnitude of noxiousness of threatened event and the probability of its occurrence. Increase in perceived likelihood had no effect; increments in perceived noxiousness or severity strengthened intentions to alter behavior.

Thomas A. Heberlein
"The Land Ethic Realized: Some Social Psychological Explanations for Changing Environmental Attitudes"
Journal of Social Issues
Vol. 28, No. 4, 1972, pp. 79-87
keys: values, attitudes, responsibility, sociology, psychology

Author argues there has been a change in attitude toward environment from an economic orientation to a moral one which includes the view that humans are related to natural world. Cites earlier study on littering (Heberlein, 1971, unpublished) demonstrating when people both are aware of the consequences of their actions and feel personally responsible they will behave according to moral norms rather than economic experience. The physical environment became a moral issue because actions which had an effect on the environment came to fit this model. Paradoxically, science has helped increase awareness of consequences, and technology, by providing alternative courses of action, has made the decision-maker responsible.

Jody M. Hines, Harold R. Hungerford, Audrey N. Tomera
"Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis"
Journal of Environmental Education
Vol. 18, No. 2, 1987, pp. 1-8
keys: attitude, efficacy, belief, responsibility

Study analyzed psycho-social variables in relation to environmental behavior. The following variables were found

to be associated with responsible environmental behavior: knowledge of issues, knowledge of action strategies, locus of control (efficacy), attitudes, verbal commitment and sense of responsibility. Selected demographic variables were also analyzed including age, education, income, gender. Education had a positive correlation; age had a negative correlation; income and gender had no significant correlation.

Joseph R. Hopper and Joyce McCarl Nielsen
"Recycling as Altruistic Behavior: Normative and Behavioral Strategies to Expand Participation in a Community Program"
Environment and Behavior
Vol. 23, No. 2, March 1991, pp. 195-22
keys: recycling, altruism, attitude, social networks, role model, behavior, sociology

Findings supported hypothesis that recycling is a form of altruistic behavior. The perceived social norm to recycle influenced behavior only through an intervening personal norm to recycle, and the personal norm translated into behavior only when awareness of consequences was high. By definition, altruistic behavior is normative, and norms are developed through social interaction. Block leaders gave personal encouragement. This social interaction may initiate the social processes which shape norms, a normative process conceptualized in the altruism model. It is also possible that block leaders influenced behavior directly through modeling (suggesting need for further research along behavioral analysis lines). Introducing social interactions around recycling can increase behavior, whatever the motivations may be.

Robert B. Huebner and Mark W. Lipsey
"The Relationship of Three Measures of Locus of Control to Environmental Activism"
Basic and Applied Social Psychology
Vol. 2, No. 1, 1981, pp. 45-58
keys: efficacy, attitude, activism, sociology, psychology

The results of this study (questionnaire and panels to measure before and after effects) indicate a relationship between locus of control (when the locus of control is internal, we believe our lives are a result of our own actions) and environmental action. Rather than being a generalized relationship, however, it is specific to the context of the behavior under consideration. The internal dimension alone of locus of control accounted for the success in predicting willingness to engage in environmentally responsible activities. In addition to a high belief in their own ability to influence events, activists showed little belief in the role of chance but did

indicate that powerful outside interests also had considerable influence on environmental events. When locus of control was measured more broadly, it remained unchanged in light of changes in external circumstances; when it was measured in situation-specific terms, it did show change under the influence of an adverse sociopolitical event (defeat of a nuclear safeguard initiative). The environmental activists maintained their internal rating for locus of control, but increased their beliefs in the influence of powerful others and in the role of chance.

Harvey E. Jacobs and Jon S. Bailey
"Evaluating Participation in a Residential Recycling Program"
Journal of Environmental Systems
Vol. 12, No. 2, 1982-83, pp. 141-52
keys: recycling, incentives, information, sociology

This study evaluated the effectiveness of a number of interventions on recycling, including information only, small payment, lottery set-up with larger prize, and more frequent collection. The lottery group demonstrated the greatest increase in participation of any group. There was, however, no appreciable change in the mean amount of paper collected per house in any neighborhood group. This study also included a cost-benefit analysis: measuring the cost of implementing each intervention against the revenues from sale of collected paper. No group generated sufficient revenues to pay for costs of program operation; though the information group accumulated the lowest deficit. Suggestions are made for how to modify program so that it could be cost-effective, including more intermittent prompts, fewer prizes, and a less expensive maintenance program.

James M. Jasper
"The Political Life Cycle of Technological Controversies"
Social Forces
Vol. 67, No. 2, December 1988, pp. 357-77
keys: attitude, values, psychology

Different dynamics influence public opinion in different periods of the life cycle of technology. Political context is the main variable which explains differences. The prepolitical period is dominated by confidence in the experts; media attention leads to politization; depolitization is the result of the end of the attention cycle. Basic values are key to attitudes in fully politicized periods.

Robert W. Jeffery
"Risk Behaviors and Health: Contrasting Individual and Population Perspectives"
American Psychologist

Vol. 44, No. 9, September 1989, pp. 1194-201
keys: risk perception, psychology

In the individual view, causes of behavior are personal. Variables of interest are those that identify each person such as biologic endowment, social upbringing, values, beliefs, education, etc. Individualistic interventions try to change a person's character or skills to help her cope with the world. In personal decision making, individuals can diverge from rationality in the following ways: 10-15 years is the most distinct practical horizon that is salient to the general population; the magnitude of reward in behavior is outweighed by immediacy of event; one's own health risks are underestimated. From the population perspective, physical, cultural, and environmental variables are important in the prevalence of risk behavior rather than interindividual differences. Population level interventions act on population level variables and modify the broader environment in which people live. The population perspective is a rational one that seeks to maximize the quantity of life. Intervention strategies approach risk behaviors as a public health problem. Strategies might include: economic incentives and sanctions, passive protection from environmental hazards, and control of promotional practices.

Daniel Kahneman and Amos Tversky
"Choices, Values, and Frames"
American Psychologist
Vol. 39, No. 4, 1984, pp. 341-50
keys: framing, risk assessment

Explanation of some anomalies in consumer behavior when people organize outcomes of transactions. Acceptability of an option can depend on whether a negative outcome is evaluated as a cost or as an uncompensated loss. For ordinary decision making the correspondence between decision values (contribution of anticipated outcome to attractiveness of option) and experience value (degree of pleasure, pain, anguish, etc.) is not perfect.
Summary of biases in personal decision making: (a) an elevated sensitivity to potential loss as opposed to potential gain (i.e., preference to maintain current state of affairs and defend against losses rather than maximize potential gains); (b) a tendency to prefer certainty over chance; (c) a tendency to discount very small probabilities entirely, and (d) a tendency to evaluate risk choice relative to normative expectations about usual or expected outcomes rather than in absolute terms.

Richard D. Katzev and Theodore R. Johnson
"Comparing the Effects of Monetary Incentives and Foot-in-the-Door Strategies in Promoting Residential Electricity Conservation"

Journal of Applied Social Psychology
Vol. 14, No. 1, 1984, pp. 12-27
keys: conservation, reward, commitment, psychology

This study frames conservation as a form of prosocial behavior and asks whether it can be influenced by foot-in-the-door and minimal justification techniques. Justifications of behavior when strong external measures (such as a monetary reward) are present tend to be based on these external sources rather than on internal convictions and are then likely to discontinue behavior when external justifications are removed. Groups consisted of questionnaire group, commitment, questionnaire plus commitment, incentive, and questionnaire plus commitment plus incentive. Commitment had a limited effect on compliance. Conclusion: the mere provision of monetary incentives is not always a sufficient condition for promoting energy conservation. But, contrary to theory, the rewards did not undermine compliance during conservation period or during follow-up period when payments were no longer made. Authors note weakness of study was that it took place during early and later spring when energy demands are not extremely high and conservation effects might not be very visible.

Richard D. Katzev and Anton U. Pardini
"The Comparative Effectiveness of Reward and Commitment Approaches in Motivating Community Recycling"
Journal of Environmental Systems
Vol. 17, No. 2, 1987-88, pp. 93-113
keys: recycling, psychology, incentives

This study begins from a position which questions the use of incentives, particularly extrinsic incentives (such as rewards) in promoting resource conservation in general and recycling in particular. Problems with incentive programs have been documented: they are not always cost effective (Jacobs and Bailey, 1982-83); they are not effective in encouraging participation; and they have failed to produce long-term, enduring behavior change (Witmer and Geller, 1976). This study draws on an alternative social influence strategy based on the minimal justification principle which emphasizes the importance of modest rather than highly attractive, external justifications in controlling behavior. Within this framework, it is speculated that individuals will be more likely to attribute their behavior to external sources when external justifications are increasingly salient. Individuals who are performing a response may stop when the external reward is removed, for they have come to believe that they do the activity for the reward. This account suggests that highly attractive external incentives won't lead to long-lasting behavior changes because they do not permit the individual to develop sufficiently powerful internal mechanisms of

control. If moderate levels of external justification can be employed to promote recycling, for example, individuals may be more likely to perceive their behavior as intrinsically as opposed to extrinsically motivated. The minimum justification principle emphasizes the development of internal mechanisms of control and implies that techniques of social control which foster these kinds of changes will be extremely effective in promoting and sustaining changes in behavior.

The study found that recycling was greater in the groups where there was a commitment (whether a commitment only group or a commitment plus a token reward). Results don't provide evidence to support the belief that incentives are required to promote recycling. In practical terms, it may be more effective to have individuals commit themselves to performing a behavior than rewarding them for doing so.

Willett Kempton, Craig Harris, Joanne Keith, and Jeffrey Weihl
"Do Consumers Know 'What Works' in Energy Conservation?"
Marriage and Family Review
Vol. 9, Nos. 1/2, Fall 1985
keys: message, knowledge, perception, anthropology, cost, energy efficiency

Consumer perceptions of energy conservation lead to an overemphasis on curtailment and management methods and neglect of efficiency investments (energy conservation seen as a "sacrifice"). Consumers estimate an appliance's energy use by perceptual salience, so something like television would be overestimated. After discovering biases, researchers did an informational mailing--mailing did not measurably correct the identified biases.

Willett Kempton, Daniel Feuermann, and Arthur E. McGarity
"'I Always Turn It on Super': User Decisions About When and How to Operate Room Air Conditioners"
Energy and Buildings
January 1992

Use of air conditioners was studied to determine how user needs, concepts, and behavior influence energy consumption. Study finds people limit use on basis of factors that include folk theories of appliance function, body heat tolerance, personal approach to all machines, beliefs and preferences concerning health and comfort, and alternative means of cooling off. User control was a crucial determinant of device operating characteristics.

Willett Kempton
"Lay Perspectives on Global Climate Change"
PU/CEES Report No. 251, August 1990
keys: attitudes, values, behavior, framing, anthropology

Kempton reveals public's misconceptions about what

global warming is, how people distort information in order to fit concepts into their known world. Support for environmental protection may arise because people have immediate experience with environmental problems and have seen degradation of local environment themselves. An important part of environmental support is local: preserve local areas and protect one's own health. In trying to get at whether people regarded preservation of environment as a moral issue, Kempton found people initially answered the question in terms of the public debate and logical self-interest rather than personal values. Kempton identified the value given to future generations in general and to one's descendants in particular as Americans' most widely and strongly held point of reference for environmental values. The basis for a species preservation ethic is present. Interviewees usually related species extinctions most directly to animals they had personally seen. People do not understand what energy efficiency is, because they have little direct contact with it. When analysts talk about reducing energy use, lay people interpret it as decreasing energy services. Interviewees broadly objected to an adaptation strategy (over a prevention one), and regarded it as a way of postponing or avoiding decision making. Recommends strategies for communicating with the public. (Study problem noted: small sample size from single geographical area.)

Willett Kempton
"Two Theories of Home Heat Control"
from *Cultural Models in Language and Thought*,
Dorothy Holland and Naomi Quinn (eds.)
Cambridge University Press, 1987
keys: belief, behavior, energy efficiency, anthropology

Relationship between folk theory, the story we have for explaining how something works, and behavior patterns in thermostat use. This study looks into the cognitive and social systems that generate behavior. The folk theory endorsed by the experts may not lead to the desired behavior when applied to practical use. Also, the folk theory persists even when people are presented with different scientific information (i.e., it is resistant to change). People may reinterpret scientific information to fit with preexisting folk theory.

Mary C. Kernan, Beverly Heimann, and Paul J. Hanges
"Effects of Goal Choice, Strategy Choice, and Feedback Source on Goal Acceptance, Performance, and Subsequent Goals"
Journal of Applied Social Psychology
Vol. 21, No. 9, 1991, pp. 713-33
keys: efficacy, behavior, feedback, sociology, psychology

One factor of theoretical and practical importance in

the study of contextual factors that affect the goal-performance relationship is choice. It was hypothesized that participation in setting goals results in positive outcomes such as higher performance and goal acceptance. These outcomes are believed to result from increased feeling of efficacy (personal control). This study examines the effect of participative goal setting when a broader perspective, (i.e., joint effects of goal and strategy choice on goal acceptance and performance) also includes feedback. Goal acceptance was the only variable in which maximum degree of choice was superior. For the behavioral variables, too much choice may be detrimental. Subjects performed better or set higher goals when at least one factor (goals, strategy, feedback) was imposed by an external source. It may be difficult to manage several choices on novel tasks. Feedback source did not independently affect subsequent goals of performance. Self-feedback did not result in higher goals or performance.

Norbert L. Kerr
"Illusions of Efficacy: The Effects of Group Size on Perceived Efficacy in Social Dilemmas"
Journal of Experimental Social Psychology
Vol. 25, 1989, pp. 287-313
keys: efficacy, sociology

Individuals feel more self-efficacious when group size is smaller. Bandura has noted that social factors (vicarious experience of others' performance, persuasive messages concerning one's efficacy) may affect self-efficacy judgments in individual performance contexts; but a much broader range of social factors may be relevant for collective tasks, including beliefs about group structure, group process and other members' likely task behavior. Action in collective tasks will likely depend not only on perceived self-efficacy, but also on perceived collective efficacy, a group belief that they can solve problems through concerted effort.

Kaye H. Kilburn and Raphael H. Warshaw
"Effects of Individually Motivating Smoking Cessation in Male Blue Collar Workers"
American Journal of Public Health
Vol. 80, No. 22, November 1990, pp. 1334-37
keys: smoking risk assessment, framing, belief, sociology

Demonstration of the adverse personal effects of smoking appear to contribute to the decision to quit or reduce smoking rate.

Howard Levanthal and Paul D. Cleary
"The Smoking Problem: A Review of the Research and Theory in Behavioral Risk Modification"
Psychological Bulletin

Vol. 88, No. 2, 1980, pp. 370-405
keys: smoking, behavior, risk assessment, perception, sociology

Recent increases in success rates may be due to changes in the social environment that multiply the action of previously unsuccessful procedures. Changing norms and values, evolving definitions of the role of the individual in society, and shifting perceptions of the importance of self-regulation as opposed to technological intervention are important in determining the extent and meaning of smoking in our society. The individual's preparation, experimentation, becoming a smoker, regular use, decision to quit, etc. all occur in a social context. The norms and values of the context direct the smoker's attention and provide interpretations or meaning for specific experiences.

David M. Ludington
"Smoking in Public: A Moral Imperative for the Most Toxic of Environmental Wastes"
Journal of Business Ethics
Vol. 10, 1991, pp. 23-27
keys: smoking, values

Article gives the ethical bases for disallowing smoking in public places.

Barbara VanOss Marin and Gerardo Marin, et al.
"Cultural Differences in Attitudes Towards Smoking: Developing Messages Using the Theory of Reasoned Action"
Journal of Applied Social Psychology
Vol. 20, No. 6, 1990, pp. 478-93
keys: smoking, ethnicity, belief, behavior, message, social networks, sociology, psychology,

Family-related consequences of smoking contributed more to the attitude toward smoking for Hispanics than non-Hispanic whites. Data suggest that concern for children and fear of displeasing other family members may be powerful cultural motivators to quit smoking in this group.

Gerardo Marin, Elisea J. Perez-Stable, Barbara VanOss Marin
"Cigarette Smoking among San Francisco Hispanics: The Role of Acculturation and Gender"
American Journal of Public Health
Vol. 79, No. 2, 1989, pp. 186-98
keys: smoking, ethnicity, gender, sociology

Level of acculturation to the mainstream culture can influence smoking behavior.

Michael Mazis
"Antipollution Measures and Psychological Reactance Theory: A Field Experiment"
Journal of Personality and Social Psychology

Vol. 31, No. 4, 1975, pp. 654-60
keys: behavior, psychology

Experiment measured housewives' reactions to and acceptance of changing to non-phosphate detergent under different circumstances. Results supported idea of psychological reactance, that is, individuals may respond to pressure to behave a certain way by doing the opposite. Housewives who felt forced to change detergents, were less positive about the product than those who felt more freedom in changing.

Edward McAuley, Susan Wraith, and Terry E. Duncan
"Self-Efficacy, Perceptions of Success, and Intrinsic Motivation for Exercise"
Journal of Applied Social Psychology
Vol. 21, No. 2, 1991, pp. 139-55
keys: fitness, efficacy, intrinsic motivation, perception, sociology, psychology

The social cognitive approach which maintains that intrinsic interest is generated as self-efficacy and self-evaluative mechanisms begin to operate appears to be a substantiated interpretation of intrinsic interest in exercise behavior. (Ryan et al., proposed intrinsic motivation to be multidimensional and included perceived competence, effort, interest-enjoyment, pressure-tension, perceived choice.)

James McGuiness, Allan P. Jones, and Steven G. Cole
"Attitudinal Correlates of Recycling Behavior"
Journal of Applied Psychology
Vol. 62, No. 4, 1977, pp. 376-84
keys: recycling, attitudes, behavior, psychology

Study attempted to identify the variables related to various levels of participation in a paper recycling program. Intercorrelations among attitude scales were high as were correlations of attitude scales with normative belief. The strongest negative correlation was alienation from the city. There was no significant correlation between recycling and alienation from neighbors, age, family size, socioeconomic status, number of papers received. There also appeared to be systematically different attitudes for those who did not recycle and those who were super recyclers. These results tend to argue for some consistency of relationship between attitude and behavior for the two extremes of participation.

Jan R. McStay and Riley E. Dunlap
"Male-Female Differences in Concern for Environmental Quality"
International Journal of Women's Studies
Vol. 6, No. 4, 1983, pp. 291-301
keys: gender, belief, message, activism, anthropology

There is modest support for prediction that women are more environmentally concerned than men. After controlling for age, education, income, and residence, women engage in personal behaviors that demonstrate concern for the environment more often; but are less likely than males to engage in public behaviors on behalf of environment. Thelower levels of women's environmental activity may be a consequence of women's lower level of political activity in general. Whatever barriers inhibit general political activity are the same ones that inhibit environmental activity.

Murray G. Millar and Abraham Tesser
"Attitudes and Behavior: The Cognitive-Affective Mismatch Hypothesis"
Advances in Consumer Research
Vol. 17, 1990, pp. 86-90
keys: attitudes, behavior, psychology

Thought about one's attitudes has inconsistent effects on the attitude-behavior relationship. Sometimes thought increases the correlation between attitudes and behaviors and sometimes thought decreases the correlation. One way to understand this is to assume that the reports individuals give concerning their attitudes are based on whatever aspect of the attitude is salient when the report is given: affect or cognition. The cognitive component of attitude contains attributes and beliefs about the attitude object, and the affective component of the attitude encodes emotions and feelings associated with the object. Consummatory behaviors, ones engaged in for their own sake, are likely to be affectively driven. Instrumental behaviors, ones intended to accomplish a goal independent of the attitude object, are likely to be cognitively driven.
If the affective and cognitive components of an attitude are not aligned, it is possible for thought to produce different attitude reports about the same object. So, at any one moment, it is possible for the individual to have different attitudes toward an object: some based on feelings toward the object and some on beliefs about the object. Immediate environmental factors are important in determining which of the attitudes held about the object is reported: whether those conditions make affect or cognition salient.

Paul Mohai and Ben Twight
"Age and Environmentalism: An Elaboration of the Buttel Model Using National Survey Evidence"
Social Science Quarterly
Vol. 68, No. 4, December 1987, pp. 798-815
keys: age, political affiliation, activism, sociology

Age is the strongest and most consistent predictor of environmental concern. Place of past residence has a stronger effect on environmental concern than current

residence. Availability of resources rather than willingness to take risks is a more likely determinant of environmental activism.

Paul Mohai
"Black Environmentalism"
Social Science Quarterly
Vol. 71, No. 4, December 1990, pp. 743-65
keys: ethnicity, belief, behavior, efficacy, sociology

Black concern for the environment is identical to that of whites; but participation is lower. Explanations for this are not completely accounted for by differences in socioeconomic status and knowledge of government. Other possibilities: blacks direct limited resources to higher priority problems; structural barriers exist between black/white interactions.

Paul Mohai
"Men, Women and the Environment: An Examination of the Gender Gap in Environmental Concern and Activism"
Society and Natural Resources
Vol. 5, 1992, pp. 1-19
keys: gender, concern, activism, sociology, psychology

Mohai concludes from a review of the literature that no firm conclusions can be drawn about the effects of gender on concern about general environmental issues. Some studies do show women to be more environmentally concerned; yet there is also evidence that women are less politically active on environmental issues. Purpose of study is to look at national survey data to evaluate various explanations of these differences.

The political socialization explanation is that women are socialized to be politically passive while men are socialized to be politically active. The situational explanation is that the roles of mother and homemaker tie women down with home responsibilities and leave them little time for outside activities. The structural explanation sees gender differences as a result of differences in socioeconomic characteristics such as educational attainment, income, occupational status.

Study found that differences in socioeconomic characteristics, environmental concern, and knowledge of government are not sufficient by themselves to explain differences in rates of environmental activity. Homemaker status and full-time employment also did not appear to account for gender differences. Neither structural nor situational explanations fully account for gender differences in environmental activity. The factors inhibiting the environmental activity of women were unique to the area of environmental activity and not simply an extension of lower general political activity. One possible explanation is that fewer resources are available to women

for any single issue because women face more issues as a group than do men.

Paul Mohai
"Public Concern and Elite Involvement in Environmental-Conservation Issues"
Social Science Quarterly
Vol. 66, No. 4, December 1985
key: socioeconomic, activism, attitude, efficacy, sociology
Upper-middle class environmental activism reveals a link between socioeconomic status and factors of activism, rather than between the socioeconomic status and environmental concern. The environmental activism of the upper-middle class is the result of that class's greater access to resources and greater sense of personal efficacy, rather than its unique concern for the environment.

Martha C. Monroe and Stephen Kaplan
"When Words Speak Louder Than Actions: Environmental Problem Solving in the Classroom"
Journal of Environmental Education
Vol. 19, No. 38, 1988, pp. 38-41
keys: education, information, experience, efficacy
The purpose of this study was to determine effective strategies for teaching environmental problem solving by surveying classroom teachers in Michigan who indicated they believed they helped students develop these skills. Classroom strategies include simulations, role plays, field trips, guest speakers, case studies, values activities, moral dilemmas, local issues, and action projects. Teachers' success was based on those who had the most students who showed an interest in or who participated in environmental problem solving activities. The following strategies were used most often by the successful teachers: case studies about solutions, trying to solve problems, case studies about what students can do to help, talking about what others do to help, becoming aware of others' beliefs. While most effective learning experiences were not literally experiential, neither were they lecture situations in which students were not involved in problem solving process. Teachers who were successful differed in circumstantial information from less successful teachers only in that they were more interested in the environment.

Denton E. Morrison and Riley E. Dunlap
"Environmentalism and Elitism: A Conceptual and Empirical Analysis"
Environmental Management
Vol. 10, No. 5, 1986, 581-89
keys: elitism, sociology
The frequent charge that environmentalism is "elitist" is examined conceptually and empirically. First, the

concept of elitism is analyzed by distinguishing three types of accusations made against the environmental movement: (a) compositional elitism suggests that environmentalists are drawn from privileged socioeconomic strata, (b) ideological elitism suggests that environmental reforms are subterfuge for distributing benefits to environmentalists and/or costs to others, and (c)impact elitism suggests that environmental reforms, whether intentionally or not, in fact have regressive social impacts.

The evidence bearing on each of the three types of elitism is examined, and the following conclusions are drawn: Compositional elitism is an exaggeration, for although environmentalists are typically above average in socioeconomic status (as are most sociopolitical activists), few belong to the upper class. Ideological elitism may hold in some instances, but environmentalists have shown increasing sensitivity to equity concerns and there is little evidence of consistent pursuit of self-interest. Impact elitism is the most important issue, and also the most difficult to assess. It appears that there has been a general tendency for environmental reforms to have regressive impacts. However, it is increasingly recognized that problems such as workplace pollution and toxic waste contamination disproportionately affect the lower socioeconomic strata, and thus reforms aimed at such problems will likely have more progressive impacts.

Nancy Newhouse
"Implications of Attitude and Behavior Research for Environmental Conservation"
Journal of Environmental Education
Vol. 22, No. 1, 1990, pp. 26-32
keys: knowledge, attitude, efficacy, responsibility, role models, psychology and sociology

The factors identified as having positive influence on environmentally responsible behavior are: sense of efficacy, sense of responsibility, understanding of issues and action strategies, and positive attitude. The modeling approach has certain shortcomings (such as, failing to provide learner with skills to make own future decisions). The discrepancy between attitude and behavior in studies may be the result of poor research design. The most powerful experiences seem to be "life" experiences. There does seem to be a high consistency between attitude and behavior if both dimensions are measured correctly.

Marvin E. Olsen
"Consumers' Attitudes Toward Energy Conservation"
Journal of Social Issues
Vol. 37, No. 2, 1981, pp. 108-31
keys: values, energy efficiency, belief, attitude, behavior, norms, psychology

General attitudes toward the energy problem are not associated with reported conservation actions, but people who anticipate experiencing direct personal consequences from the energy problem are more likely to take action to save energy. Energy attitudes may also affect behavior as a result of the development of social norms about saving energy.

Stuart Oskamp, Maura J. Harrington, Todd C. Edwards, Deborah L. Sherwood, Shawn M. Okuda, and Deborah C. Swanson
"Factors Influencing Household Recycling Behavior"
Environment and Behavior
Vol. 23, No. 4, July 1991, pp. 494-51
keys: recycling, belief, attitudes, behavior, friends, psychology

Study investigated attitudes, behaviors, and knowledge in a So. California city that had begun a citywide curbside recycling program. Study demonstrates that different environmentally responsible behaviors have different patterns of antecedents. Particular significant variables: living in a single-family house; owning one's own home; recycling by one's friends and neighbors (highly visible modeling stimulus). Most of the attitudinal factors were better predicted by other attitudinal variables than by demographics, knowledge, or behavioral variables. The attitudinal items significantly related to curbside recycling participation were ones focusing specifically on recycling rather than on broader environmental concerns: i.e., general proenvironmental attitudes did not predict curbside recycling behavior, but attitudes specific to recycling did.

Anton U. Pardini and Richard D. Katzev
"The Effect of Strength of Commitment on Newspaper Recycling"
Journal of Environmental Systems
Vol. 13, 1983-84, pp. 245-54
keys: recycling, commitment, sociology

Findings of study illustrate three effects of commitment techniques: gaining a commitment from individuals increased frequency and amount of behavior; the greater the strength of the commitment, the greater the magnitude of outcomes; those who had made a strong commitment to recycle continued to do so even when they were no longer bound by commitment. These results suggest that commitment techniques may be a promising method to overcome the difficulties incentives- based approaches have in promoting sustained changes in recycling across a large number of individuals.

John C. Pierce, Nicholas P. Lovrich, Jr., Taketsugu Taketsugu Tsurutani, and Takematsu Abe

"Environmental Belief Systems Among Japanese and American Elites and Publics"
Political Behavior
Vol. 9, No. 2, 1987, pp. 139-59
keys: international, belief, sociology

Article examines elite and mass environmental belief systems in America and Japan. Questions whether postindustrialism further elevates the special status of elites and drives elite belief systems in different countries toward each other and farther away from their respective publics. Japanese environmentalism has been "victim"-oriented, concerned primarily with the negative impact on humans of alterations in the natural environment; while American environmentalism is generally thought to be concerned primarily with the preservation of the environment in its natural state. Modern environmentalism's focus on the "New Environmental Paradigm" as manifested in Japan appears a less radical departure from the "Dominant Social Paradigm" than it is in the US.

The distance between elite and mass public belief systems is greater in US (Spokane) than Japan (Shizuoka Prefecture). Japan has a much more homogeneous society and political culture than the US. Environmental politics in Japan are single-locale oriented, deriving from the localism of the Japanese. These findings highlight the persistence of cross-national differences in elite belief systems. Social homogeneity, a tradition of localized politics, the character of policy conflict, and distance traveled along the postindustrial path are all factors which can influence the distance between elite and mass social strata.

Diane M. Samdahl and Robert Robertson
"Social Determinants of Environmental Concern"
Environment and Behavior
Vol. 21, No. 1, January 1980, pp. 57-81
keys: demographics, concern, sociology

Sociodemographic variables were ineffective in explaining any of the three types of environmental concern measured: perceptions of environmental problems in local community; support for environmental regulations; and ecological behaviors. (Sociodemographics measured: size of residential community, education, income, age, anti-laissez-faire liberalism, welfare state liberalism.) Pro-regulatory liberalism was important component of support for environmental regulations, but not for other environmental measures.

The search for ideological premises of environmental concern has led beyond the limits of political ideologies; Dunlap and VanLiere found that the dominant social paradigm could explain more variation in levels of environmental concern than could sociodemographic variables. Future studies may benefit more by focusing on broader belief

systems rather than sociodemographics.

Charles D. Samuelson and Michael Biek
"Attitudes Toward Energy Conservation: A Confirmatory Factor Analysis"
Journal of Applied Social Psychology
Vol. 27, No. 7, 1991, pp. 549-68
keys: energy efficiency, attitude, belief, cost, framing, efficacy, sociology, psychology

Study replicated work by Seligman and Becker in identifying four principal dimensions underlying attitudes and beliefs regarding energy use: comfort and health; high effort-low payoff; role of individual consumer; legitimacy of energy problem. Study reinforces conclusion that future energy conservation campaigns should be sensitive to consumers' concerns about comfort and health, the effort/saving tradeoff, perceived efficacy of individual conservation efforts, and the perceived legitimacy of the nation's energy problem.

Thomas C. Schelling
"Addictive Drugs and the Cigarette Experience"
Science
Vol. 255, January 1992, pp. 430-33
keys: smoking, attitude, behavior, credibility, sociology

Change in smoking behavior occurred without efforts by government. It is associated with changes in attitudes, expectations, and norms. Noticeable efforts at abstinence generate a social environment that is supportive of efforts to abstain. Smoking is coming to be identified with lower education and employment status.

Shalom H. Schwartz
"Normative Explanations of Helping Behavior: A Critique, Proposal, and Empirical Test"
Journal of Experimental Social Psychology
Vol. 9, 1973, pp. 349-64.
keys: norms, behavior

Article examines normative explanations of helping behavior. Hypothesis that the impact on behavior by norms is a function of ascription of responsibility to the self (AR) is tested through the mailing of a questionnaire about bone marrow donation (to a stranger). Subsequent volunteering to donate was substantially impacted by norms in those with high AR rates. Altruism research is greatly influenced by widely held norms. Norms were found to be socially acceptable subsequent justifications rather than precursory causes of action. Norms are rarely used as predictors. While personal and social norms may overlap, a personal norm is distinct in its emphasis on moral obligation. AR combined with a personal norm of interaction

was found to lead all others as a predictor of behavior (Wicker, 1969). Norms are more likely to influence behavior the greater the time there is to formalize them (based on general values)
before acting.

Shalom H. Schwartz and John A. Fleishman
"Personal Norms and the Mediation of Legitimacy Effects on Helping"
Social Psychology
Vol. 41, No. 4, 1978, pp. 306-15
keys: norms, altruism, behavior

This study looks at the cognitive mechanisms that might explain how legitimate need elicits helping behavior more than illegitimate need. Theory makes use of the concept of personal norms. Personal norms refer to self-expectations for behavior backed by the anticipation of self-enhancement or self-deprecation. Personal norms are built up from the person's general value system and are experienced as feelings of obligation to act in a particular manner in specific situations. Personal norms differ from general attitudes toward an object in their focus on specific actions and on feelings of obligation; they differ from general social norms in referring to internalized self-expectations. Among those with strong personal norms, substantial help will be forthcoming from those with norms which favor help, and little help will come from those whose personal norms oppose help, regardless of the legitimacy of need. Those who have little sense of obligation, that is, weak personal norms related to the issue, will help more when the need is perceived as legitimate than when it is illegitimate.

Shalom H. Schwartz and Richard C. Tessler
"A Test of a Model for Reducing Measured Attitude-Behavior Discrepancies"
Journal of Personality and Social Psychology
Vol. 24, No. 2, 1972, pp. 225-36
keys: behavior, attitude, psychology

Four sources of attitude-behavior discrepancy are identified. The capacity of Fishbein's model to cope with two of these sources--inadequate sampling of potential antecedents and inadequate conceptualization and measurement of attitudes-- was assessed in a study of intentions regarding six kinds of medical transplant donation among 195 adults. The model's three components--attitude toward the act, personal normative beliefs, and social normative beliefs--explained an average of more than 50% of the variance in intentions, with personal normative beliefs consistently the strongest contributor followed by attitude toward the act and social normative beliefs. Regression weights of the model's components remained relatively stable

across kinds of transplant and across classifications of persons by demographic, experience, and personality characteristics. The model was insufficient, however, to obviate the need for sampling further from the multitude of antecedents of behavior. With regard to attitude measurement, attitude toward the act proved superior to the traditional type of index. Data from a validation study suggested that when the model was used to predict volunteering to become a bone marrow donor months later, it was not superior either to one of its components (personal normative beliefs) or to one alternative model for predicting behavior.

Clive Seligman and John M. Darley
"Feedback as a Means of Decreasing Residential Energy Consumption"
Journal of Applied Psychology
Vol. 62, No. 4, 1977, pp. 363-68
keys: energy efficiency, behavior, commitment, information, feedback, communication

Providing immediate feedback to homeowners about their daily use of electricity reduced consumption. Other aspects in the treatment of feedback may have also contributed to reduced energy usage including: homeowner commitment to experiment and development of favorable attitudes which helped sustain motivation to conserve. An area of future study in the area of feedback would be its effectiveness over time.

Clive Seligman, John M. Darley, and Lawrence J. Becker
"Behavioral Approaches to Residential Energy Conservation"
Energy and Buildings
Vol. 1, 1977-78, pp. 325-77
keys: energy efficiency, attitude, motivation, behavior, feedback, psychology

A study in Twin Rivers attempted to determine whether it was possible to distill from the varied attitudes that people hold about energy a few basic attitudinal dimensions that reflect people's conceptualizations of energy consumption and whether these attitudinal dimensions are related to energy consumption. Seven attitudinal categories were represented: perceived bother; discomfort associated with conservation; health questions; legitimacy of energy crisis; belief in science; morality of issue; role of individual. The attitudinal variables were successful in predicting energy use. Significant were: comfort, health, and role of the individual. The most significant was a high level of effort that produced a low level of pay-off. Legitimacy of energy crisis accounted for only trivial proportion of variance.

Another study looked at efficacy of feedback. Information about energy consumption can be an effective

strategy for promoting energy conservation. Feedback cues individuals to procedures that are most successful and also motivates them to try harder or longer at task. Another feedback study demonstrated better results with the group which set the more difficult goal. Another study with feedback did not result in significant savings--apparently because participants did not perceive feedback as credible.

Clive Seligman, Lawrence J. Becker, and John M. Darley
"Encouraging Residential Energy Conservation Through Feedback"
Advances in Environmental Psychology, Vol. 3
Hillsdale, N.J.: Erlbaum Associates
keys: feedback, energy efficiency, psychology

Energy conservation in housing is both a technological and a behavioral problem. It is possible to save a large percentage of energy used in homes through appropriate engineering practices. It is also possible to save energy by bringing psychological insight to bear on the problem. A distinction can be made between what it takes to influence people to make one-shot changes to homes and to behave differently in homes.

Psychological aspects of the problem involve an approach that includes all those living in the home; one that is concerned with behavior that occurs over time; one that makes energy consumption more salient; and one that can fit into a family's everyday routine, i.e., isn't too disruptive. Feedback meets these criteria. A possible explanation of why feedback works is that it provides goal-relevant information. A precondition for it to work is that the individual is motivated to conserve. Feedback, then, can show that actual conservation is below the level someone wants to achieve, thereby triggering an increased effort.

This study gave groups of homeowners both feedback and a conservation goal. The group with a difficult goal and no feedback saved little more than the control group. The real savings were achieved by the group with the difficult goal receiving feedback. Without feedback, it is difficult for people to know whether their efforts are sufficient.

Benefits of feedback may include that it demonstrates to those with only tentative commitment to energy conservation that saving energy is not as hard as they thought, thereby encouraging increased conservation. Feedback may also help people maintain conservation when it gets difficult. It also helps keep the idea of energy conservation salient. Factors that affect whether feedback is effective are its credibility, homeowners' initial commitment to saving energy, possibly its frequency, and whether it is given in a way that is meaningful to the recipient.

James F. Short, Jr.
"The Social Fabric at Risk: Toward the Social Transformation of Risk Analysis"
American Sociological Review
Vol. 49, December 1984, pp. 711-25
keys: risk, sociology

Sociological concerns with the social fabric serve as a bridge between various sociological specializations to form a basis for a "social transformation" of risk analysis. The focus of risk analysis on human life and health, and on economic values, has been too narrow, to the neglect of other valued and necessary aspects of human existence.

Young-dahl Song and Tinsley E. Yarbrough
"Tax Ethics and Taxpayer Attitudes"
Public Administration Review
Vol. 38, September/October 1978, pp. 442-51
keys: values, efficacy, trust, sociology

The overall level of tax ethics is low. Most of the variables that are significantly related to high tax ethics have shown signs of deterioration in the last two decades. Harris polls show that percentages for sense of powerlessness, cynicism, and alienation have been climbing since 1966. Also, there has been a long-term decline in the level of the public's political trust.

John H. Sorensen
"Knowing How to Behave Under the Threat of Disaster"
Environment and Behavior
Vol. 51, No. 4, July 1983, pp. 438-57
keys: risk assessment, information, education, psychology

The assumption that by increasing society's level of awareness of hazards, the public will be better able to cope with or adapt to them is examined. This article describes the results of an empirical study designed to explore relationships among hazard education, awareness, and knowledge. Individual processes of acquiring information on natural hazards is diverse and fragmented. The possibility is raised that different processes may be needed to explain knowledge of adaptive responses according to hazard type of the nature of the threat posed by the hazard. Contrary to other studies, awareness of a hazard was not found to be a good predictor of knowledge of adaptive behavior. Previous experience of a hazard *was* found to be a good predictor of knowledge of how to respond to a given disaster.

Mary Ann E. Steger, John C. Pierce, Brent S. Steel, and Nicholas P. Lovrich
"Political Culture, Postmaterial Values, and the New Environmental Paradigm: A Comparative Analysis of Canada and the United States"
Political Behavior

Vol. 11, No. 3, 1989, pp. 233-54

This paper investigates the relationship between postmaterial values and the New Environmental Paradigm in Canada (Ontario) and the US (Michigan). Postmaterial values include such things as an emphasis on personal and political freedom, participation, equality, tolerance of minorities, openness to new ideas, environmental protection and self-actualization. Canadians possess a more organic, collectivistic political culture than do Americans, and the holistic theme of the NEP would seem to conform with their collectivistic bent. Canadians are more likely to be postmaterialists and to support the NEP. These results indicate that postmaterial values and environmentalism are separate constructs in the thinking of both Canada and the US.

Paul Stern
"Learning Through Conflict: A Realistic Strategy for Risk Communication"
Policy Sciences
Vol. 24, 1991, pp. 99-119
keys: risk, values, information, framing, communication

Defining technological conflicts as ones of risk perception is simplistic. These conflicts are essentially political. Risks are not assessed in a value-neutral manner.

Paul Stern
"Psychological Dimensions of Global Environmental Change"
Annual Review of Psychology
Vol. 43, 1992, pp. 269-302
keys: behavior, conservation, psychology

Current psychological research which applies to an understanding of the relationship between human behavior and the environment includes attitude theory, theory of social dilemmas, applied behavior analysis, theory of altruistic behavior, the cognitive psychology of judgment and choice as applied to the study of environmentally relevant attitudes, beliefs, and actions. Different types of behavior are different along many dimensions such as time and money involved and ease of decision. Contextual influences have an effect on decisions.

Research on environmental attitudes has still not been cumulative. It is not clear whether environmental attitudes are one thing or many. Environmental concern has been represented in different ways: as an ecological awareness; as an anthropocentric altruism (people care about the environment not for its own sake but because its loss represents a threat to human health and well being); as a function of egoism (concern about the environment represents concern about the effects on self and family); and as a function of a deeper cause such as underlying religious

beliefs.

Individual behaviors can affect collective action. The behavior of firms is influenced by the demand for products and services. It can also affect choice of personnel. Individuals affect communities and governments through leadership and through pressures put on leaders through public opinion and lobbying. Political behavior includes voting, signing petitions, participating in demonstrations. It is not clear whether political behaviors about the environment have the same psychological basis as consumer behaviors.Values have a psychological component. Article provides a good summation of current psychological research.

Paul C. Stern, Elliot Aronson, John M. Darley, Willett Kempton, Daniel H. Hill, Eric Hirst, and Thomas J. Wilbanks

"Answering Behavioral Questions About Energy Efficiency in Buildings"

Energy

Vol. 12, No. 5, 1987, pp. 339-53

keys: feedback, message (credibility, vividness), framing, incentives

Article identifies behavioral questions that arise with policy interventions for energy efficiency in buildings:

1. Information. The effects of energy information depend not only on completeness but on credibility, specificity, comprehensibility, vividness (Stern and Aronson, 1984); this suggests using surveys to identify misconceptions about energy use in homes and using community groups to implement energy programs because information is spread more successfully due to their credibility and reliance on word-of-mouth. (Stern, et al., 1986)

2. Incentive programs. Size of incentive may not be a strong factor, because people can only compare incentives in hypothetical situations. The same incentive won't appeal to everyone. Non-financial features of incentive programs such as availability of technical assistance, consumer protection features, credibility of program sponsor, quality of interaction between clients and program personnel may be critical to a program's success. (Stern, et al., 1986)

3. Standards. If energy efficiency is an explicit consideration when consumers choose buildings or appliances, better information will make their decisions more economically rational in terms of energy. If energy is not considered, standards will be a more effective way to increase efficiency.

4. Technological research and development. The practical effect of any new technology depends on choices about its purchase and use. Adoption decisions depend on whether estimates of energy savings from the new technology are reliable. It is hard to make these estimates when the energy savings depend not only on the operation of the

technology but also on the behavior of those who use it.

Paul C. Stern, Elliot Aronson, John M. Darley, Daniel H. Hill, Eric Hirst, Willett Kempton, Thomas J. Wilbanks
"The Effectiveness of Incentives for Residential Energy Conservation"
Evaluation Review
Vol. 10, No. 2, April 1985, pp. 147-76

Article looks at studies which have evaluated incentive programs for residential energy efficiency to determine whether size and type of incentive make a difference and to assess the role of the nonfinancial aspects of these programs. Larger incentives increase participation, but marketing and implementation may be more important than incentive size. Authors call for more research emphasizing issues of program design, marketing and implementation, particularly implementation which looks at credibility of sponsoring organization, and how to promote word-of-mouth communication.

Paul C. Stern, Thomas Dietz, and J. Stanley Black
"Support for Environmental Protection: The Role of Moral Norms"
Population and Environment
Vol. 8, Nos. 3 & 4, Fall/Winter 1985-86, pp. 204-22
keys: values, framing, responsibility, activism, altruism, sociology, psychology

Mobilization of public support for the environmental movement cannot be easily explained by simple models of self-interested behavior. The results of such movements benefit everyone and not just those who participate in them. This support suggests that motives other than the short-term and individualistic may motivate people to act. Support for environmental protection depends in part on a moral judgment where environmental problems are seen as morally intolerable. This involves situations where problems are seen as a threat and where it is possible to ascribe the responsibility to someone. The extended norm-activation theory implies that overt action depends not only on a normative judgment (belief that something *ought* to be done) about someone's moral obligations but also on a norm for personal action that depends on a belief that one's action can make a difference. Authors present a model of social-psychological processes that impel people to act or support action against environmental pollution. Preliminary test of model produced results consistent with the underlying supposition that support for environmental protection has a moral dimension.

However, the norms that respondents apply to government seem to be of a different kind: The government was viewed as having a moral obligation to act to solve certain kinds of

collective problems whether or not it was responsible for causing them.

The concept of norm activation is helpful in explaining how people come to support social movements that benefit others but not themselves. Interest group analysis, however, has greater difficulty explaining public support for causes that do not offer tangible benefits to any clearly defined social group. The model suggests that mobilization of support for such causes and for the advancement of minority interests will be more successful when framed in terms of avoiding harmful consequences to people in ways that lead potential converts to see themselves as personally responsible. The model also suggests that successful efforts to mobilize support for such causes will make references to consequences and responsibility in an effort to activate altruistic norms in potential supporters.

Paul C. Stern, Thomas Dietz, and Linda Kalof
"Value Orientations, Gender, and Environmental Concern"
Environment and Behavior
ARTICLE UNDER REVIEW
keys: values, altruism, gender, psychology

This paper expands on the Schwartz model of norm activation by proposing an integrative theoretical model of environmental concern. The authors develop a model that incorporates three value orientations: concern for the welfare of other humans, "humanistic altruism"; concern with nonhuman species or the biosphere, "biospheric altruism"; and egoism or self-interest. All three value orientations predict willingness to take political action regarding the environment. Some of the anomalies in contingent valuation research may be the result of focus effects: different sets of environmental attitude questions draw attention to different value frames and, therefore, yield differing degrees of environmental concern. In one sample, gender differences are the result of gender differences relating to the effects or consequences of environmental problems; there were no substantial male-female differences in value orientations toward egoism or either type of altruism. Women tend to see environmental quality as having consequences for personal well-being, social welfare, and the health of the biosphere. When these gender-differentiated belief systems are taken into account, other differences disappear.

Paul C. Stern
"Blind Spots in Policy Analysis: What Economics Doesn't Say About Energy Use"
Journal of Policy Analysis and Management
Vol. 5, No. 2, 1986, pp. 200-22
keys: economics, information, attitude, behavior, values, incentives, psychology

Article describes the difficulties of reducing analysis of energy use to an application of economic theory. When economic concepts are given the most obvious behavioral interpretations, they lead to an overemphasis on variables such as price and incentive size and an underemphasis on factors such as communication, misinformation, trust, motivation, program implementation, and consumer assurance, which can make more of a practical difference than substantial changes in financial conditions. Energy analysts could be more effective if they had knowledge about what information consumers already have and about how people respond to information in realistic settings. Concepts about information economic theory already makes use of:

* information is more likely to change behavior when it is specific, vivid, and personalized
* feedback also helps--but it is not obvious from economic theory that feedback should be more reliably effective than specific instructions about what actions to take to save energy
* information that attracts consumers' attention is more effective; the source of information, particularly its trustworthiness, can make a difference.

Attitudes and beliefs about specific energy-related actions have more effect on behavior than general energy attitudes. Adoption of new investments may also have a momentum, such as that described by cognitive dissonance theory: small changes lead energy consumers to change their views of themselves in ways that lead to later, larger changes, that is, past actions can change consumer preferences.

Paul C. Stern and Gerald T. Gardner
"Psychological Research and Energy Policy"
American Psychologist
Vol. 36, No. 4, April 1991, pp. 329-42
keys: information, marketing, attitude, psychology

Article presents a behaviorally oriented analysis of the US energy system and its implications for psychological research. Some energy conservation decisions must be frequently repeated while some only need to be made once. The first are amenable to strategies based on principles of behavior modification. For "one shot" behaviors, influence techniques based on an understanding of the multiple determinants of consumer choices may be more appropriate.

Paul C. Stern and Eileen M. Kirkpatrick
"Energy Behavior: Conservation Without Coercion"
Environment
Vol. 10, No. 9, December 1977, pp. 10-15
keys: conservation, psychology, attitude

The authors want to find an alternative solution to the schools of thought about energy conservation which maintain

that the only effective strategy is to offer incentives or penalties to change the behavior of individuals (that is, since energy use brings about immediate rewards to the consumer, conservation will come about only if it can be made to serve the short-term interests of individuals) and that which sees attitude change as essential to achieving energy conservation. The problems with use of strong incentives or pressure in changing attitudes include: psychological reactance research shows that when people are not able to choose a mode of behavior, the lost option becomes the most attractive one; and "overjustification" theory which shows that when people are given a clear extrinsic reason for doing something they would have done anyway, their intrinsic motivation is undermined. A strategy is presented for influencing groups. The use of incentives and verbal appeals can shape a group consciousness that in turn pressures individuals to change their attitudes and to act in the long-tern interest of the group. Attitudes are maintained by social forces rather than by more obvious incentives. One element of success in the application of the theory in lab games may have been due to the public commitment groups members made. The difficulty of creating a group consciousness at the national level suggests that a program of this type must be directed at smaller groups within society.

Paul C. Stern and Stuart Oskamp
"Managing Scarce Environmental Resources"
Handbook of Environmental Psychology, Vol. 2
New York: John Wiley & Sons, 1987

This section summarizes the psychological research findings in the following resource problem areas:

1. Environmental attitudes. There is some evidence for a construct of general environmental attitudes (VanLiere and Dunlap, 1981), though not strong. Many types of research indicate that attitudes and behavior can influence each other with other variables often mediating these relationships (Kelman, 1980). Positive relationships between ecological attitudes and environmentally protective actions have not been established as causally connected. Some behavior analysts argue that environmental concern does not even predict behavior that should be related to it. (Geller, et al., 1982) The failure of verbal communication to change environmentally relevant behavior is due to four factors: a) communication techniques are often ineffective (Ester and Winett, 1982); b) attitudes and beliefs are embedded in personal values and social contexts that are hard to change (Heberlein, 1981); c) attitudes formed through personal experience are likely to be confidently held and hard to change; d) there is a mismatch in specificity between attitude measures which are usually general and behavioral indexes which are usually specific.

Studies have shown that neither general environmental concern nor belief in the seriousness of the energy crisis is sufficient to ensure that people will take specific personal actions to conserve energy. It seems that attitudes that are closely related to a person's basic values will be the ones most apt to be carried into behavior. 2. Litter Control; 3. Recycling and Solid Wastes; 4. Conservation of Land; 5. Water Conservation; 6. Environmental Pollution; 7. Energy Conservation

Dorceta E. Taylor
"Blacks and the Environment: Toward an Explanation of the Concern and Action Gap Between Blacks and Whites"
Environment and Behavior
Vol. 21, No. 2, March 1989, pp. 175-205
keys: ethnicity, concern, behavior, efficacy, sociology

The environmental concern gap that exists between blacks and whites can be better understood by exploring the gap that exists between concern and action. There is only weak evidence showing that environmental *concern* is associated with socioeconomic status. Environmental activists, however, show a different socioeconomic profile from the environmentally concerned: activists are drawn from the upper-middle class. Article also discusses measurement errors in previous studies: blacks and whites may define terms differently; blacks' responses may be a function of what they are familiar with; the number of blacks in samplings has generally been small, masking differences among black social classes.

Explanations for the action gap include: stepping stone (one needs to experience the first part of the process to take part in the second); voluntary associations (most blacks do not fit the socioeconomic profile of environmentalists, so the chance of fellowship with other members is low); political efficacy (political assertion through citizen organizations rather than individual contacts is more characteristic of blacks than whites); non-recognition of advocacy channels (government officials are unresponsive). Among members of the lower-middle-class, unsatisfactory responses by governing elites lead to feelings of powerlessness and hostile outbursts. In the upper-middle-class, the same things encourage participants to influence the political process through bureaucratic-political tactics; collective action problems (groups are mobilized according to the degree of preexisting group organization). Groups with weak identities produce few intragroup networks and are less likely to mobilize. Efforts to increase black environmental activism should focus on: solidarity; cognitive perception of reality (develop political efficacy) resources; and psychological factors (ideology, discontent).

Anne P. Tracy and Stuart Oskamp
"Relationships Among Ecologically Responsible Rehaviors"
Journal of Environmental Systems
Vol. 13, No. 2, 1983-84, pp. 115-26
keys: behavior, attitude, psychology

Article focuses on the diversity of the behavioral aspects of energy conservation. There may exist several dimensions to ecologically responsible behaviors. If so, we cannot assume that any single behavior may be generalized to any other. More participation was found in one-shot behaviors than in repetitive behaviors. No general factor accounted for major variance in all of the behaviors. There was little correlation between energy attitudes and energy behavior. For many people, the behaviors were just not feasible: e.g., some needed goods were available only in plastic containers.

Amos Tversky and Daniel Kahneman
"The Framing of Decisions and the Psychology of Choice"
Science
Vol. 211, No. 30, January 1981, pp. 453-58
keys: framing, psychology

Article describes decisions in which people do not demonstrate consistency and coherence, i.e., rational choice. People frame decisions in different ways, and the frame that someone adopts is influenced by formulation of the problem, also by norms, habits, and personal characteristics of the decision-maker. A change of perception can influence the desirability of an option. Inconsistencies can be traced to the interaction of two sets of factors: 1) variations in the framing of acts--contingencies and outcomes; and 2) nonlinearities of values and decision weights. Complexities arise in the normative analysis of decision making because the framing of an action sometimes affects the actual experience of its outcomes, i.e., the way we frame an outcome may influence how we respond.

Kent D. Van Liere and Riley E. Dunlap
"Moral Norms and Environmental Behavior: An Application of Schwartz's Norm-Activiation Model to Yard-Burning"
Journal of Applied Social Psychology
Vol. 8, No. 2, 1978, pp. 174-88
keys: perception, behavior, responsibility, psychology

Study findings were tentative but did support the contention that moral norms governing the welfare of human beings will influence environmental behavior, if the behavior is defined as possibly harmful to people. A number of factors besides moral norms may influence behavior, such as anticipated costs, social pressures, behavior of models, etc. However, behavior is *more* in accordance with normative expectations when both awareness of consequences and

ascription of responsibility were high. Non-acceptance of responsibility may explain why public awareness of environmental problems has not led to widespread adoption of environmental behaviors--even when those problems pose a serious health threat. In addition to awareness of harmful effects, the source of the effects must be known and there must also be viable alternatives to the behavior before it will be given up.

Kent D. Van Liere and Riley E. Dunlap
"The Social Bases of Environmental Concern: A Review of Hypotheses, Explanations and Empirical Evidence"
Public Opinion Quarterly
Vol. 44, 1980, pp. 181-97
keys: age, social class, residence, gender, political affiliation

Evidence suggests a correlation between social factors and environmental concern: age, education, political ideology--though demographic factors have only limited explanatory value.

Kent D. Van Liere and Riley E. Dunlap
"Environmental Concern: Does It Make a Difference How It Is Measured?"
Environment and Behavior
Vol. 13, No. 6, November 1981, pp. 651-76
keys: attitude, psychology

Study motivated by desire to find a measure for "environmental concern," specifically to determine whether different measures capture the same underlying construct of environmental concern, or actually reflect different concepts. For example, some measures of environmental concern deal separately with different issues such as pollution, population, and natural resources, while others lump these together. It is not clear whether attitudes toward these different issues reflect equally the concept of environmental concern. Also, there are many different ways of conceptualizing concern about the environment such as perceived seriousness of environmental problems, support for spending on environmental issues, knowledge about environmental problems, etc.

Results suggest that the practice of combining items that focus on a wide range of issues into a single measure of concern is not a wise course. It does make some difference in how environmental concern is measured. Concern about population issues is distinct from concern about natural resources and pollution, which were correlated. In theoretical conceptualizations there was correlation except for the behavioral indicators.

Elaine Vaughan
"Chronic Exposure to an Environmental Hazard: Risk

Perceptions and Self-Protective Behavior"
Health Psychology
IN PRESS
keys: risk assessment, attitudes, behavior, ethnicity, anthropology

Greater perceptions of pesticide risk among immigrant farmworkers were associated with beliefs that: past harm had occurred; future harm to self or to offspring was likely; precautions were minimally effective; and cancer-causing agents are mostly unavoidable. Self-protective behavior was most likely for those receiving information about the risk, having greater perceptions of control over health effects and the occupational risk situation, and believing that precautionary methods were generally effective.

Elaine Vaughan and Brenda Nordenstam
"The Perception of Environmental Risks Among Ethnically Diverse Groups"
Journal of Cross-Cultural Psychology
Vol. 22, No. 1, March 1991, pp. 29-60
keys: ethnicity, risk perception, self-efficacy, framing, psychology

Individuals who share similar experiences, attitudes, and values ascribe similar meanings to phenomena. Group differences in perceptions of risk may be best understood within the context of prior experiences that shape one's perspective on risk. Currently there is no extensive evidence that the empirical and conceptual relationships described in the literature can be generalized across all groups. Ethnic background is one factor associated with systematic differences in judgments on risk issues. Article puts forward three hypotheses to explain these: differences in levels of exposure to risks or prior experience; dissimilarities in general perspective on risk and environment; nonequivalent values on those qualitative dimensions which influences assessments of environmental risk.

JoAnne Vining and Angela Ebreo
"What Makes a Recycler? A Comparison of Recyclers and Nonrecyclers"
Environment and Behavior
Vol. 22, No. 2, January 1990, pp. 55-73
keys: recycling, demographics, sociology

Recyclers were better informed overall about recycling than nonrecyclers: they had more accurate information and were more informed about local programs. Nonrecyclers may selectively ignore or discount information as irrelevant to their own behavior. Recyclers and nonrecyclers were no different in the strength of their belief that protecting the environment was an important reason to recycle. This result may provide some support for the contention that

dissonance prevents nonrecyclers from recalling recycling information. Social influences on recycling were not reported as important factors by either group. Perhaps because recycling behavior in this study was not open to public scrutiny. Social influence should be a more powerful motivator when behavior can be observed by peers. Also respondents may not have wanted to admit they were influenced by others. Nonrecyclers found convenience and monetary issues more important reasons for not recycling than recyclers.

There were only weak differences in the demographic characteristics of recyclers and nonrecyclers. Both groups were similar in occupation, most income categories, and household size. Recyclers were older than nonrecyclers. Familiarity with sources of information tended to vary with income and education. Newspapers were a more likely information source for those with higher incomes and education; and school programs and TV were more popular with those from lower and middle income households. This is important information for targeting audiences.

Mark C. Wagstaff and Beth E. Wilson
"The Evaluation of Litter Behavior Modification in a River Environment"
Journal of Environmental Education
Vol. 20, No. 1, 1988, pp. 39-44
keys: littering, behavior, modeling, information, sociology

Study looked at effectiveness of verbal appeals and role modeling in campsites in a river rafting area. Raft guides delivered verbal appeals and modeled behavior. When role modeling and verbal appeals were used with commercial rafting groups, they appeared to improve litter pickup behavior.

Russell Weigel and Joan Weigel
"Environmental Concern: The Development of a Measure"
Environment and Behavior
Vol. 10, No. 1, March 1978, pp. 3-16
keys: psychology, attitude, behavior

This research seeks an attitude measure capable of assessing the individual's relatively enduring beliefs and feelings about ecology which might then indicate a predisposition to engage in pro or anti-environmental actions. Such a tool could be used to track longitudinal shifts in public concern and to evaluate the attitudinal consequences of environmental policies.

The proposed Environmental Concern Scale is composed of 16 statements which focus on a wide range of conservation and pollution issues. Each item correlated positively with the respondent's subsequent behavioral responsiveness to a request for help by a Sierra Club member. Random samples from two medium-sized New England towns were used. The

results supported the hypothesis that the scale could predict variation in overt behavior over an extended period of time.

A number of recent studies indicated attitude-behavior relationships can be obtained when intervening variables are systematically considered, when the attitude measured specifies the behavioral criterion employed, and when multiple behavioral measures are combined to form a criterion which is sufficiently elaborate to reflect the breadth of the attitude domain assessed. Comment on how cognitive dissonance theory and psychological reactance theory could help predict response to a mandatory bottle deposit law.

Kipling Williams, Stephen Harkins, and Bibb Latane
"Identifiability as a Deterrent to Social Loafing: Two Cheering Experiments"
Journal of Personality and Social Psychology
Vol. 40, No. 2, 1981, pp. 303-11
keys: social influence, psychology, sociology

As in previous research, people exerted less effort when working in groups than when working alone. When individuals were identifiable, this "social loafing" was eliminated. When individual outputs are always identifiable (even in groups), people consistently exert high levels of effort, especially if other people are in some way important sources of reinforcement; and if their outputs are never identifiable (even when alone) they exert low levels of effort across all group sizes. Identifiability seems to be an important mediator of "social loafing." Authors believe identifiability is important because it assures the contingency between effort and outcome. When individual performances are unidentifiable, there can be no causal relation between response and outcome.
(Note: Seligman (*Helplessness*, 1975) on learned theory of helplessness. Claim is that people and animals exposed to situations where there is no relationship between their responses and their outcomes--positive or negative--learn to experience feelings of helplessness, which can in turn lead to reactions ranging from loss of motivation to severe depression. In a collective action situation, this could definitely lead people to lessen their efforts.)

Jill F. Witmer and E. Scott Geller
"Facilitating Paper Recycling: Effects of Prompts, Raffles, and Contests"
Journal of Applied Behavior Analysis
Vol. 9, No. 3, 1976, pp. 315-22
keys: recycling, behavior, incentives, sociology

Prompts (flyers) had little effect in increasing paper-recycling behaviors; the raffle did increase the amount of paper brought to a recycling center; and a contest increased

the amount somewhat. Students with easiest accessibility to the center showed greatest participation. With removal of reinforcement contingencies behavior returned to baseline levels.

John Wittenbraker, Brenda Lynn Gibbs, Lynn R. Kahle
"Seat Belt Attitudes, Habits, and Behavior: An Adaptive Amendment to the Fishbein Model"
Journal of Applied Social Psychology
Vol. 13, No. 5, 1983, pp. 406-21
keys: seat belts, attitudes, behavior, sociology, psychology

Changing attitudes can have an impact on behavior; however, changing subjective norms, intentions, and perhaps most importantly habits will have a more powerful effect on behavior. Even an important behavior such as seat belt use is motivated by forces outside the realm of volitional control (implying the need for such things as passive restraints and multidimensional influence attempts).

Suzanne M. Yates and Elliot Aronson
"A Social Psychological Perspective on Energy Conservation in Residential Buildings"
American Psychologist
Vol. 38, April 1983
keys: knowledge, message (vivid, personal), perception, models (friends), folk theory (cognitive dissonance), efficacy

Discusses limitations of the rational-economic model to predict human behavior. Situational factors can override logic and cause people to follow preferences that are not economically rational. There is a need to take into account cognitive, social, and personal forces.

REPORTS

Colorado Department of Health
Better Air Campaign
Market Research and Statistical Evaluation
April 1989

An informational campaign designed to get people to cut down on driving and wood burning and to see the direct relationship between their behavior and air pollution. Knowledge, awareness, and interest increased, but changes in behavior were extremely small. Thus, either voluntary programs are a bad idea or the strategies to carry out this program were not effective. Public opinion does not support first conclusion. So, if the second conclusion is correct, we need to reexamine the program. Education is a "key factor" according to this study "if long-term and permanent change is a goal." Motivation is another factor. "In the long term, it is probably the internal motivation to be part

of the solution that will be most effective."

McDonald's Corporation and Environmental Defense Fund
Waste Reduction Task Force
Final Report - April 1991
Report outlines McDonald's source reduction progress--to reduce both quantity of packaging and change nature of packaging (from polystyrene foam to paper wraps); reuse and recycling efforts as well. Report discusses how suppliers were also affected.

JALA Associates Technical Reports
Vol. 1, No. 2, June 1988
"Traffic Reduction by Telecommuting: A Status Review and Selected Bibliography" by Jack M. Nilles

Science Advisory Board
Report made to Environmental Protection Agency
"Reducing Risk: Setting Priorities and Strategies for Environmental Protection"
September 1990

PART VI: A DIRECTORY OF HUMAN RESOURCES

One of the best indexings of people who work in the pollution prevention area can be found in a directory published by USEPA. The title and document number for that is "1993 Reference Guide to Pollution Prevention Resources;" published February, 1993; Document # EPA/742/B-93-001.

One more excellent directory available through the National Pollution Prevention Center and compiled by Nandkumar Bakshani and David Allen of the University of California, Los Angeles, can be obtained through the National Pollution Prevention Center at The University of Michigan, Dana Bldg, 430 E. University, Ann Arbor, MI, 48109-1115 is the Directory of Pollution Prevention in Higher Education: Faculty and Programs, 1992 (Document # 93-2).

Below is a partial list of people who work in pollution prevention or whose work has a bearing on cultural barriers and facilitators. This list is in no way meant to be exhaustive.

Carol Aby
Planning Manager
ADEQ
3033 North Central
Phoenix AZ 85016
(602) 207-4601

Bruce Anderson
Deputy Director
Hawaii Dept. of Health
P.O. Box 3378
Honolulu HI 96801
(808) 586-4424
FAX (808) 586-4444

Jesse Baskir
P2 Coordinator
US EPA
75 Hawthorne, H-1-B
San Francisco CA 94105
(415) 744-2190/1796
FAX (415) 744-1796

Tom Brotherton
Governor's Energy Conservation Office
State of Colorado
1675 Broadway, Suite 1300
Denver CO 80202-4613
(303) 620-4292

Allan Brandt
Department of Social Medicine
University of North Carolina
Chapel Hill NC 27599
(919) 962-1136

Shawn M. Burn
Department of Psychology and Human Development
California Polytechnic State University
San Luis Obispo CA 93407

Peter Cebon
MIT Room E52-511
2 Sloan School of Management
Cambridge MA 02139
(617) 253-8431

Bill Crooks
Executive Office
Central Valley RWQCBD
3443 Routier Road
Sacramento CA 95827-3098
(916) 255-3039

James Crowfoot
School of Natural Resources
The University of Michigan
Ann Arbor MI 48104-1115
(313) 763-5466

John M. Darley
Department of Psychology
Princeton University
Princeton NJ 08544

Raymond De Young
School of Natural Resources
University of Michigan
430 East University
Ann Arbor MI 48109-1115

Kevin Dick
Manager, Business Environment Program
Small Business Development Center
University of Nevada
College of Business Administration/032
Reno NV 89557-0100
(702) 784-1717 FAX:(702) 784-4337

John Dunlap
CAL EPA
Department of Toxics
400 P. Street
Sacramento CA 95814

Riley E. Dunlap
Department of Sociology
Washington State University
Pullman WA 9916-4020
(509) 335-3810 FAX:(509) 335-6419

Andrew Duncan
School of Natural Resources
The University of Michigan
Dana Building - 430 E. University
Ann Arbor MI 48109-1115
(313) 764-6529

Dana Duxbury
President
The Waste Watch Center
16 Haverhill St.
Andover MA 01810
(508) 470-3044 FAX:(508) 470-3384

Sandra Eberhardt
Unit Manager
ADEQ
3033 North Central
Phoenix AZ 85016
(602) 207-4210 FAX:(602) 207-4236

Terry Foecke
WRITAR
Waste Reduction Institute
1313 5th Street SE, Suite 325
Minneapolis MN 55414-4502

FRANCIS GROUP
49 Gilmour Road
Edinburgh EH16 5NV
United Kingdom
44-(0)31-667-3996

Kris Franklin
UNR-SBDC
UNR, MS 032
Reno NV 89557-0100

Melanie Gaier
US EPA
75 Hawthorne St.
San Francisco CA 94105
(415) 744-1939

Scott E. Geller
Department of Psychology
Virginia Polytechnic Institute
Blacksburg VA 24061-0436

David Getches
School of Law
Campus Box 401
University of Colorado
Boulder CO 80309
(303) 492-7377

Tim Greiner
OTA
100 Cambridge St. Suite 2109
Boston MA 02202
(617) 727-3260

Anna Hackenbracht
US EPA
Chief Planning & Analysis Section
75 Hawthorne St.
San Francisco CA 94105
(415) 744-1634 FAX:(415) 744-1678

Spenser Havlick
School of Environmental Design
University of Colorado
Campus Box 314
Boulder CO 80309
(303) 492-6936

Greg Helgin
National Pollution Prevention Center
University of Michigan
430 E. University
Dana Building #2540
Ann Arbor MI 48109-1115
(313) 764-1412 FAX:(313) 936-2195

Steven Hellend
Society for the Advancement of Socio-Economics
714 H Gelman Library
2130 H Street NW
Washington DC 20052
(202) 994-8267 FAX:(202) 994-1639

David Howekamp
Director, Air & Toxics DW
US EOA
75 Hawthorne Street (A-1)
San Francisco CA 94105

Dale Jamieson
Department of Philosophy
University of Colorado
Campus Box 232
Boulder CO 80309
(303) 492-6964 FAX:(303) 492-8386

Kris Jensen
Ground-Water Branch
US-EPA
999 18th Street
Suite 500, Mail Code 8WM-GW
Denver CO 80202-2405
(303) 294-1133 FAX:(303) 293-1424

Steve Johnson
Assistant Director ADEQ
3033 North Central
Phoenix AZ 85016
(602) 207-2381

Roger Kasperson
Center for Technology, Environment, and Development
Clark University
950 Main Street
Worcester MA 01601-1477
(508) 751-4606 FAX:(508) 751-4600

April Katsura
75 Hawthorne Street, H-2-2
San Francisco CA 94105
(915) 744-2030 FAX: (415) 744-1044

Willett Kempton
College of Urban and Public Affairs
University of Delaware
Newark DE 19716
(302) 831-4502 FAX:(302) 831-3587

Kate Kramer
Pollution Prevention Waste Reduction Program
Colorado Department of Health
4300 Cherry Creek Drive South
Denver CO 80220
(303) 692-3003

Howard Kunreuther
Wharton School of Business
University of Pennsylvania
Philadelphia PA 19104

Hilary Lauer
P2 Coordinator
EPA Region 9
75 Hawthorne Street, H-1-B
San Francisco CA 94105
(415) 744-2189 FAX:(415) 744-1796

Beth Levine
Water Resources Control Engineer
SFBRWQCB
2101 Webster Street, Suite 500
Oakland CA 94612
(510) 286-0656 FAX:(510) 286-1380

Angela Liberatore
Istituto Universitario Europeo
Via Emilia 472
40064 Ozzano Emilia (BO)
ITALY 051-79 97 98

Sandra Lopez
Manager, Toxics
BAAQMD
939 Ellis Street
San Francisco CA 94105
(415) 749-4711

James L. Lounsbury
Executive Director
National Roundtable of State Pollution Prevention Programs
US EPA, OS 301
P.O. Box 7219
Silver Spring, MD 20910
(301) 495-9278

Daniel Luecke
Environmental Defense Fund
1405 Arapahoe Avenue
Boulder CO 80302
(303) 440-4901

Jack Luskin
Toxics Use Reduction Institute
University of Massachusetts
Lowell MA 01854
(508) 934-3262

Odete Madriago
Cal EPA
400 P Street
Sacramento CA 95814
(916) 255-2301 FAX:(916) 255-2222

Robert McMullin
Pollution Prevention Partnership
1099 18th Street
Suite 2100
Denver CO 80202
(303) 294-1200

Gary McClelland
Department of Psychology
University of Colorado
Campus Box 345
Boulder CO 80309
(303) 492-8617

Claudia Mills
Department of Philosophy
University of Colorado
Campus Box 232
Boulder CO 80309
(303) 492-6132 FAX:(303) 492-8386

Paul Mohai
School of Natural Resources
University of Michigan
Ann Arbor MI 48109-1115

Gay Nicholson
Ethics and Public Life
Cornell University
117 Stimson Hall
Ithaca NY 14853-7101
(607) 255-6051 FAX:(607) 255-8649

William R. Orr
Research & Technology Development Division
Integrated Waste Management Board
8800 Cal Center Drive
Sacramento CA 95826
(916) 255-2301 FAX:(916) 255-2222

Stuart Oskamp
Department of Psychology
Claremont Graduate School
Claremont CA 91711

Bill Paiss
Rocky Mountain Co-housing Association
1705 14th Street
#317
Boulder, CO 80302
(303) 494-8458

Margie Perkins
Pollution Prevention Partnership
Hewlett Packard
P.O. Box 302, MS CM 307
Loveland CO 80539

Carrado Poli
Fondazione Lanza
via Dante 55
35139 Padova, Italy
(049) 8756788 FAX:(049) 8756788

Cliff Popejoy
Senior Air Pollution Specialist
CA Air Resources Board
2020 L Street
Sacramento CA 95814

Linda G. Pratt
Program Manager, Pollution Prevention
San Diego County Department of Health Services
Hazardous Materials Division
P.O. Box 85261
San Diego CA 92186
(619) 338-2215 FAX:(619) 338-2139

Ted Rauh
Deputy Director, Hazardous Waste Program
DTSC
400 P Street
Sacramento CA 95693

Dick Reavis
Department Administrator
ND EP
123 West Nye Lane
Carson City NV 89710
(702) 687-5883

Patricia Reed
PRC Environmental Management, Inc.
1099 18th Street
Suite 1960
Denver CO 80202
(303) 295-1101 FAX:(303) 295-2818

Barbara Rhode
Directorate General xII Science
CGE\DGXII\H, ARTS/LUX3/23
200, rue de la Loi
1049 BRUXELLES
Belgium
(2) 2951869 FAX:2964299

Verne Rosse
Department Administrator NV EP
123 West Nye Lane
Carson City NV 89710
(702) 689-5872 FAX:(702) 885-0868

Joel Schurke
WRITAR
1313 5th Street, SE
Minneapolis MN 55414-4802
(612) 379-5995

Harry Seraydarian
Director, Water Management Division
US EPA
75 Hawthorne Street
San Francisco CA 94105
(415) 744-2125

Robert Simmons
Senior Policy Advisor
US EPA Region VIII
999 18th Street
Denver CO 80202
(303) 294-7009

Udo E. Simonis
Wissenschaftszentrum Berlin
Reichpietschufer 50
1000 Berlin 30
Germany
(30) 25 49 12 45 FAX:(30) 25 49 12 47

Paul C. Stern
Commission of Behavioral and Social Sciences and Education
National Research Council
2101 Constitution Ave. NW
Washington DC 20418

David Thomas
Chairman
National Roundtable of State Pollution Prevention Programs
Hazardous Waste Research and Information Center
One East Hazelwood Drive
Champaign IL 61820
(217) 333-8940 FAX:(217) 333-8944

Michael Tracey
School of Journalism
University of Colorado
Campus Box 287
Boulder CO 80309
(303) 492-0445

Klasina VanderWerf
Department of Philosophy
University of Colorado
Campus Box 232
Boulder CO 80309
(303) 492-6964 FAX:(303) 492-8386

Elaine Vaughan
Program in Social Ecology
University of California, Irvine
Irvine CA 92717
(714) 856-7184

Sonja Wallace
Pollution Prevention Program
Department of Environmental Quality
168 North 1950 West
Salt Lake City UT 84114-4810
(801) 536-4480

Kim Wilhelm
Supervising Engineer, Dept. of Toxics
CAL EPA
PO Box 806
400 P Street
Sacramento CA 95812-0806
(415) 744-2153 FAX:(415) 744-1044

Bill Wilson
Waste Minimization Coordinator
US EPA
75 Hawthorne Street (H-1-W)
San Francisco CA 94105
(415) 744-2153 FAX:(415) 744-1044

Teng-Chung Wu
Division Chief
San Francisco Bay RWQCB
2101 Webster Street, Suite 500
Oakland CA 94612
(510) 286-0899 FAX:(510) 286-1380

Laura Yoshii
Deputy Director, Hazardous Waste
US EPA
75 Hawthorne Street (H-1)
San Francisco CA 94105
(415) 744-1730

Nancy Yoshikawa
US EPA
75 Hawthorne Street
San Francisco CA 94105
(415) 744-1939

Jeff Zelikson
Director, Hazardous Waste
US EPA
75 Hawthorne Street (H-1)
San Francisco CA 94105
(415) 744-1730

CHALLENGES FOR THE FUTURE

NATIONAL POLLUTION PREVENTION ROUNDTABLE

SAN DIEGO, CALIFORNIA
APRIL 28, 1993

BY
JOHN WISE
ACTING REGIONAL ADMINISTRATOR
EPA REGION 9

I am honored to be invited to share my perspectives at this National Roundtable. It is gratifying for me to be among so many colleagues and friends tonight; for you - individually and collectively - have done so much to advance the concept of pollution prevention and to build viable programs at the state and local level.

These are exciting times ... times of change. Yet, despite the campaign rhetoric or the Clinton Administration, this "change" is not entirely new. Over the past several years, we have been witnessing and participating in a "sea change" ... a change that is trending towards a vision of environmentally responsible economic development.

In my remarks tonight, I want to examine the origins of this change; the forces and influences that are shaping and defining our journey and the challenges for the future.

A good place to start is to examine EPA's statutory mission as the defining framework for the changes that are taking place.

Today, EPA administers some 14 different statutes, each of which requires some form of pollution control and abatement. The distinguishing feature of each of these individual statutes is that they are single-purpose, media-specific, and they mandate the "control" and "abatement" of pollution. That is, all of our federal statutes mandate a regulatory/enforcement structure to control pollution releases. This has come to be known as "command and control", that is we "command" by regulation, and "control" by permits and enforcement.

Therefore, from our statutes, we can distill EPA's primary mission:

- set national standards
- promulgate regulations
- issue permits
- inspect for compliance
- enforce where necessary
- monitor for environmental result

And, of course, all of this is done in concert with the states, regional agencies, and local governments under a series of "delegation agreements" -such that "command and control" cascades down through the different levels of government.

Over the years, environmental regulation by "command and control" has produced remarkable results:

- major reduction of mass loadings of pollutants to air, water, and land;
- installed control technology (end-of-pipe, top-of-stack;
- provided essential public health protections;
- arrested ecosystem losses.

All of this has cost society roughly $1 trillion in the past 20 years. The <u>costs</u> of controlling pollution now account for roughly two percent of U.S. Gross National Product. America is now spending about $115 billion a year to meet environmental goals. The <u>benefits</u>, although not

precisely quantifiable, are the reasonably clean and healthful environment that we generally enjoy today.

America could well afford an investment of this magnitude.

We have much to be proud of.

But - when we examine our progress and the prospects for the future we can see some disconcerting trends:

1. Despite all of our gains, we are barely keeping up with growth;
2. While we made reductions in one media, we may have simply transferred the problem to another media;
3. While we are imposing regulatory costs on U.S. industry, our global competitors are gaining an unearned trade advantage.

Moreover, the environmental landscape is changing. We find that the remaining environmental problems/risks:

1. reside in a large universe of small sources;
2. require a geographic or location-specific response;
3. require a change in corporate and consumer behavior.

These features of the changing environmental landscape indicate that our traditional "command and control" regulations (mandated by statute) may not be very effective, and certainly can't be very efficient, in addressing these remaining environmental problems.

As America faces the economic realities of the 1990's, wherein we must compete in a worldwide marketplace, we cannot afford to continue to operate an inefficient environmental regulatory scheme. Over the past four-to-five years, we have seen EPA, the states, and industry all make fundamental shifts to restructure our programs for a new future - all based loosely upon the concept of pollution prevention.

What motivated these changes?

For EPA and the states, pollution prevention was initially seen as an extension of our regulatory programs. Indeed, most of the early prevention-based activity was driven by our regulatory and enforcement authorities and by the imposed costs and liabilities that attend our enforcement efforts. We used our regulatory and enforcement authorities to directly gain pollution prevention as conditions of a permit, or as terms of an enforcement settlement.

For industry, it was apparent that imposed regulatory costs - costs of permit applications, cost of end-of-pipe treatment, cost of disposal, cost of compliance, cost of non-compliance by fines

and penalties, cost of liabilities, cost of insurance - were viewed as non-productive expenses. Cost minimization and cost avoidance naturally led many industries to waste minimization programs, recycling and recovery operations, and better housekeeping; the first tentative steps towards pollution prevention...

However, I suggest that, behind the cost calculus, three other interrelated forces intersected to drive a fundamental restructuring of industrial operations towards pollution prevention:

1. the appreciation for global competitiveness and sustainable growth;
2. the public disclosure requirements of community right-to-know laws;
3. the onset of total quality management.

In the mid-1980's, many companies began to congratulate themselves for what they thought was a remarkable feat - compliance with government regulations! Today, it is not enough to simply comply with governmental regulations; a progressive company is moving "beyond compliance", and ahead of its industry in a fast-paced global economy.

What accounts for this dramatic shift in perspectives? Basically, American managers are realizing that they cannot remain fixed on a short-term preoccupation with compliance and costs. They are developing a new sense of a far greater value, that is, the concept of sustainable growth, wherein enlightened environmental management reinforces economic growth wherein long-term values of sustainability outweigh short-term costs.

This "refocusing" effort, already well underway in the mid-1980's, was given powerful impetus by the disclosure requirements of Community Right to Know Laws, such as SARA (Title III) and, in California, Proposition 65. These disclosure provisions, such as the Toxic Release Inventory, are reshaping environmental policy.

Information is power, and when citizens have information about the release of toxic substances to the air, water, or land, they demand action. The toxic release inventory has done more to reduce toxic emissions than all of our regulations taken together - simply by turning the glare of adverse publicity (and attendant liability) on companies that are releasing these chemicals. We have seen dramatic reductions (all voluntary) in chemicals released, in a frantic scramble by business to restore public confidence and corporate image.

(Despite the good news embodied in these trends, let me also issue a caution. The corporate rush to reduce releases of high volume chemicals may inadvertently bias the need to first address the releases of chemicals which pose the most serious risks. TRI deals with releases, not exposures and consequent risk to public health. Companies will need to be mindful of the necessary balance between total reductions and reductions of those chemicals that may jeopardize public health.)

John Wise, "Challenges for the Future"

At the beginning of the TRI in 1987, most companies were focused on compliance and they simply did not know what they were releasing to the environment by pathways that were not directly regulated. The numbers were astonishing and caught most corporate managers and their environmental management staff totally by surprise.

The prevailing corporate fear of public disclosure - a hostile public, angry neighbors, boycotting consumers, NIMBY - did not come to pass. The world did not end. Disclosure actually helped many companies deal with their external constituencies and neighbors.

But the real payoff came inside the company. Companies invested in internal auditing, mass balance inventorying, life-cycle costing, all of the internal techniques that provided the data necessary for accurate reporting and honest public disclosure of environmental releases. By disciplining the data collection effort and husbanding information, companies were able (for the first time!) to see how their basic production processes were leading to the generation of wastes and to economic inefficiencies.

The need for data enabled the environmental managers to work with the production managers to ask some fundamental questions: How can we minimize waste? How can we prevent pollution? How can we change inputs, change processes? How can we produce green products in a green way?

This data-driven self-examination of performance is (as you know) a fundamental quality process. As total quality management drives the production process toward prevention-based operations, companies are reassessing their role: the ultimate purpose of the corporate endeavor is to compete in a global economy, not to passively comply with rules and regulations.

And, in order to compete, American companies will need to retool for clean production technologies:

a. where prevention changes the cost profile;
b. where information from environmental managers and production managers merge to form a new direction for the company;
c. where new total quality principles of continuous improvement and process reform drive us to achieve our environmental and economic goals.

We have seen that total quality management, where process information drives prevention-based behavior, can result in significant payoffs:

1. reduction or elimination of a waste;
2. conservation of materials, conservation of water;
3. energy efficiency;
4. technical accomplishment;
5. financial benefit;

6. sharpening the competitive edge of American industry;
7. the ultimate benefit - removing the company entirely from regulatory jurisdiction:

    - no more permit applications;
    - no more inspections;
    - no more reporting;
    - no more treatment and disposal costs;
    - no more enforcement fines and penalties;
    - no more liabilities;
    - no more excuses!

We have certainly witnessed a dramatic change in EPA, in the states, and in the business community in the way we seek to accomplish our environmental goals.

- EPA is shifting from regulator to cooperator.
- Industry is shifting from compliance to competitiveness.

We have made much progress, but our journey has just begun. As we look toward the future, from the platform of accomplishment to date, we face four major challenges.

These challenges are:

1. To articulate prevention-based behavior as a prevailing social/cultural ethic.

2. To diffuse that ethic to a larger community:

    - within EPA itself;
    - externally with our state and local partners;
    - vertically down through the business establishment;
    - horizontally across all sectors of U.S. enterprise.

3. To promote clean and green technology to retool America for the global marketplace; and

4. To promote total quality and continuous improvement by measuring progress and celebrating success.

Let me examine each of these challenges in turn.

1. To articulate prevention-based behavior as a prevailing social/cultural ethic:

We need to recognize that pollution prevention is not just another activity, not just another initiative, not just another program that is layered on top of everything else we do.

John Wise, "Challenges for the Future"

Pollution prevention is a fundamental new philosophy which needs to be incorporated as an integral and central component of all environmental policy; all economic and industrial activity; all consumer behavior. We need to appreciate that pollution prevention requires a new cultural orientation - we need to reach deeply into the culture and values of society and create a fundamental new philosophy, or ethic.

This new ethic will be the underlying integrating force - the essential linchpin - to unify environmental and economic policy for long-term sustainability.

2. **To diffuse this prevention-based ethic to a larger community.**

This diffusion effort must begin with EPA itself. If we are to make pollution prevention the strategy of preferred choice in the Agency, we must incorporate prevention into our ongoing regulatory and program agenda - to mainstream prevention into the core values of the Agency.

The diffusion effort must naturally extend externally to our state and local partners, where so much initiative and progress have already been made in developing pollution prevention as the centerpiece of state programs. We need to continue to develop a network of EPA/state collaboration.

I suggest that it is time to systematically integrate federal grant assistance and state resources invested in pollution prevention. We have gained much from the various EPA grant programs, PPIS, two percent set-asides, and media program grants, but we must now construct a larger framework (or strategy) for our unified efforts.

The State Grants Guidance, issued November 12, 1992, by former Deputy Administrator Habicht, is the perfect vehicle to systematically integrate our efforts. I encourage maximum utilization of the opportunities for flexibility that the Guidance provides.

The diffusion effort must be vertically implemented. That is, major large corporations are already well along the prevention-based transition; we must devote increasing attention to medium, and small, businesses. These smaller enterprises are caught in the regulatory "web", without the technical, managerial, or financial ability to comply. Assisting these firms to engage in pollution prevention investments, rather than end-of-the-pipe, will enhance their economic productivity and competitiveness, as well as their compliance needs.

The diffusion efforts must be horizontally implemented. That is, our major focus to date has been on manufacturing industry. We need to expand our efforts to address pollution prevention needs in the agricultural sector, the transportation sector, the energy sector, the consumer sector, and most importantly, the federal sector.

All of these efforts at diffusion, inside EPA, with the states, vertically down to medium and smaller businesses, and horizontally across all economic sectors, represents a truly heroic challenge.

3. To promote clean and green technology to retool America for the global marketplace.

As we engage new principles of continuous improvement and process reform to drive us to our environmental and economic goals, we must surmount a formidable challenge. It is no less than "retooling America" for clean production technology.

The Europeans and Japanese have been relatively successful in developing and deploying clean production technologies as part of their national industrial policies. While some of this has occurred in larger U.S. companies (often learned from their European subsidiaries), America seems to be stuck in "technology gridlock".

What accounts for this? Is it attributable to:

- lack of information for prevention-based technologies,
- lack of credit and financing,
- lack of entrepreneurialship and risk takers,
- lack of positive market signals,
- lack of research and development,
- lack of technology transfer programs,
- lack of a national industrial policy?

Or, is it attributable to the BACT syndrome, wherein federal environmental law mandates and enforces "best" available control technology, and so "locks in" the technical specifications. Why go beyond the "best" if there is no incentive or credit to do better? Why go beyond the "best" if it may risk your compliance position vis-a-vis government regulators? Why go beyond the "best" if you have just expended substantive resources on an end-of-the-pipe treatment plant?

Perhaps it is all of the above. If these are root causes of America's technology gridlock, we must systematically address each of them to enable a transition to a clean production industrial base which can effectively compete in the global marketplace. The electronics industry may be a good case study of developing advanced clean production technologies that enable them to successfully compete, domestically and internationally.

Partnerships and collaboration in research, development, and demonstration are very important factors here. I am encouraged as we mobilize the Department of Energy's National Laboratories to help in this endeavor.

Another aspect of green technologies is the export market potential for such technologies themselves. After the Rio Earth Summit, it seems that the "race for green technology" in the global marketplace may be the equivalent of the space race. It is a race that the United States cannot afford to lose, but today, it is a race that we are not even prepared to enter.

4. **To promote total quality and continuous improvement by measuring progress and celebrating success.**

Pollution prevention, like other large-scale social/economic change processes, depends on the validation of incremental successes. Moreover, pollution prevention programs are driven and sustained by information. We need to keep track of progress as prevention-based programs proliferate across the country, document real achievements, share our successes, and build public support and credibility. We need to show measurable environmental, economic, health, and safety benefits from our pollution prevention endeavors.

The transition of America toward a prevention-based ethic and a clean technology industrial base will not occur overnight. Setting high goals, striving for continuous improvement, and celebrating our successes should enlighten our path to the future.

In summary, I've taken you on a long journey: from the origins of our command and control system to the tremendous success in reducing gross mass loadings, to the development of pollution prevention concepts and programs within EPA and the states, to the extraordinary response of industry to Community Right-to-Know laws, to the four challenges of the future -

- to instill a prevention-based ethic,
- to facilitate a diffusion of that ethic to a larger community,
- to promote green technologies, and
- to measure our progress and celebrate successes.

I want to thank you for your patience to indulge me as I scoped-out my perspectives. I would be pleased to respond to questions or comments.

Thank you.